SAN FRANCISCO BAY BASIN (REGION 2)

JUNE 21, 1995

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

2101 Webster Street, Suite 500
Oakland, CA 94612
(510) 286-1255

Approved by

California State Water Resources Control Board on July 20, 1995.
California State Office of Administrative Law on November 13, 1995.

WATER QUALITY CONTROL PLAN

STATE OF CALIFORNIA

PETE WILSON
Governor

JAMES M. STROCK
Secretary, Environmental Protection Agency

State Water Resources Control Board

John P. Caffrey
Chair

Marc Del Piero
Vice Chair

John W. Brown
Member

Mary Jane Forster
Member

James M. Stubchaer
Member

Walt Pettit
Executive Director

California Regional Water Quality Control Board
San Francisco Bay Region

Peter W. Snyder
County Government
Chair

Craig S.J. Johns
Recreation, Fish and Wildlife
Vice-Chair

Josephine T. De Luca
Public
Member

E. Jackson Going Jr.
Water Quality
Member

Pamela W. Lloyd
Water Quality
Member

Richard L. Maher
Industrial Water Use
Member

Denny A. McLeod
Municipal Government
Member

Loretta K. Barsamian
Executive Officer

This Water Quality Control Plan was prepared under the direction of

Michael P. Carlin
Chief, Basin Planning

by

Randy Y. Lee
Associate Water Resources Control Engineer

Kim A. Taylor
Ph.D., Environmental Specialist III

with assistance from the following Regional Board staff

Thomas R. Gandesbery
Environmental Specialist III

Jessica Lacy
Assoc. Water Resources Control Engineer, 1990-1995

Steven M. Moore
Sanitary Engineering Associate

Stephen I. Morse
Chief, Toxics Cleanup Division

Thomas E. Mumley
Ph.D., Associate Water Resources Control Engineer

Peggy R. Olofson
Water Resources Control Engineer

Steven R. Ritchie
Executive Officer, 1988-1995

Linda L. Spencer
Associate Engineering Geologist

A. Lynn Suer
Ph.D., Environmental Specialist IV

Dyan C. Whyte
Associate Engineering Geologist

and assistance from the following State Board staff

Joanne Cox
Environmental Specialist III

John Ladd
Chief, Basin Planning Unit

Sheila Vassey
Staff Counsel III

Production

Kathryn Ankrum
Technical Editor

Darren Campeau
Graphic Designer

Carrie Salazar
GIS Specialist

Cover
Satellite Image: "The San Francisco Bay from Space"
(Copyright; Spaceshots, Inc. 1-800-272-2779)

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

CHAPTER 2: BENEFICIAL USES

CHAPTER 3: WATER QUALITY OBJECTIVES

TABLE OF CONTENTS

CHAPTER 3: WATER QUALITY OBJECTIVES CONTINUED

CHAPTER 4: IMPLEMENTATION PLAN

CHAPTER 4: IMPLEMENTATION PLAN CONTINUED

CHAPTER 4: IMPLEMENTATION PLAN CONTINUED

CHAPTER 5: PLANS AND POLICIES

CHAPTER 6: SURVEILLANCE AND MONITORING

LIST OF FIGURES

LIST OF TABLES

of the San Francisco Bay Estuary while protecting and restoring its natural resources. In 1993, the Estuary Project reached its goal of developing a *Comprehensive Conservation and Management Plan* (*CCMP*). The *CCMP* addresses five critical concerns identified by the Project's broad-based advisory committees: decline of biological resources; increased pollutants; freshwater diversion and altered flow regime; dredging and waterway modification; and intensified land use.

Implementation of the *CCMP*'s over 140 recommended actions is now underway. The Regional Board will serve as lead state agency, undertaking responsibility for ensuring that *CCMP* actions are carried out. The Estuary Project's Public Involvement and Education Program, which seeks to inform and involve the public in Estuary issues, is currently housed at the Regional Board offices.

1 INTRODUCTION

THE SAN FRANCISCO BAY REGION

The San Francisco Bay estuarine system conveys the waters of the Sacramento and San Joaquin rivers into the Pacific Ocean. Located on the central coast of California (Figure 1-1), the Bay system functions as the only drainage outlet for waters of the Central Valley. It also marks a natural topographic separation between the northern and southern coastal mountain ranges. The region's waterways, wetlands, and bays form the centerpiece of the United States' fourth-largest metropolitan region, including all or major portions of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

Because of its highly dynamic and complex environmental conditions, the Bay system supports an extraordinarily diverse and productive ecosystem. Within each section of the Bay lie deepwater areas that are adjacent to large expanses of very shallow water. Salinity levels range from hypersaline to fresh water, and water temperature varies throughout the Bay system. These factors greatly increase the number of species that can live in this estuary and enhance its biological stability.

The Bay system's deepwater channels, tidelands, marshlands, freshwater streams, and rivers provide a wide variety of habitats that have become increasingly vital to the survival of several plant and animal species as other estuaries are reduced in size or lost to development. These areas sustain rich communities of crabs, clams, fish, birds, and other aquatic life and serve both as important wintering sites for migrating waterfowl and as spawning areas for anadromous fish.

THE BAY SYSTEM'S SURFACE & GROUND WATERS

The Sacramento and San Joaquin rivers, which enter the Bay system through the Delta at the eastern end of Suisun Bay, contribute almost all the freshwater inflow to the Bay. Many small rivers and streams also convey fresh water to the Bay system. The rate and timing of these freshwater flows are among the most important factors influencing physical, chemical, and biological conditions in the Estuary. Much of the freshwater inflow, however, is trapped upstream by the dams, canals, and reservoirs of California's water diversion projects, which provide vital water to industries, farms, homes, and businesses throughout the state. This freshwater diversion has sparked statewide controversy over possible adverse effects on the Estuary's water quality, fisheries, and ecosystem.

Flows in the region are highly seasonal, with more than 90 percent of the annual runoff occurring during the winter rainy season between November and April. Many streams go dry during the middle or late summer. For example, the Napa River, which is least affected by upstream regulation, clearly shows the seasonal nature of runoff. Only 4-1/2 percent of this river's average annual runoff occurs during the summer months.

Groundwater is an important component of the hydrologic system in the San Francisco Bay region. Groundwater provides excellent natural storage, distribution, and treatment systems. Groundwater also supplies high quality water for drinking, irrigation, and industrial processing and service. As an important source of freshwater replenishment, groundwater may also discharge to surface streams, wetlands, and San Francisco Bay.

A variety of historical and ongoing industrial, urban, and agricultural activities and their associated discharges degrade the groundwater quality, including industrial and agricultural chemical spills, underground and above-ground tank and sump leaks, landfill leachate, septic tank failures, and chemical seepage via shallow drainage wells and abandoned wells. In addition, saltwater intrusion directly attributed to over-pumping has degraded the purity of some groundwater aquifers.

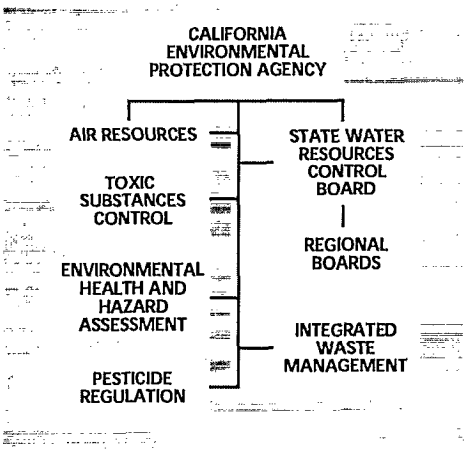
QUICK INDEX PAGE

These adverse impacts on groundwater quality often have long-term effects that are costly to remediate. Consequently, as additional discharges are identified, source removal, pollution containment, and cleanup must be undertaken as quickly as possible. Activities that may potentially pollute groundwater must be managed to ensure that groundwater quality is protected.

PROTECTING SAN FRANCISCO BAY: THE REGIONAL BOARD

Because of its unique characteristics, the San Francisco Bay estuarine system merits special protection. The adverse effects of waste discharges must be controlled. Extensive upstream water diversions must be limited, and their effects mitigated. To address these and other water issues, the California Legislature established the State Water Resources Control Board (State Board) and the nine Regional Water Quality Control Boards in 1967. Operating under the provisions of the California Water Code, their unique relationship couples state-level coordination and regional familiarity with local needs and conditions. Their joint actions constitute a comprehensive program for managing water quality in California, as well as for effective state administration of federal water pollution control laws.

ORGANIZATION OF THE CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY



The State Board administers water rights, water pollution control, and water quality functions for the state as part of the California Environmental Protection Agency. It provides policy guidance and budgetary authority to the Regional Water Quality Control Boards, which conduct planning, permitting, and enforcement activities. The State Board shares authority for implementation of the federal Clean Water Act and the state Porter-Cologne Act with the Regional Boards.

The San Francisco Bay Regional Water Quality Control Board (Regional Board) regulates surface water and groundwater quality in San Francisco Bay. The area under the Regional Board's jurisdiction comprises all of the San Francisco Bay segments extending to the mouth of the Sacramento-San Joaquin Delta (Winter Island near Pittsburg).

California's governor appoints the nine-member Regional Board, whose members serve for four-year terms. Board members must reside or maintain a place of business within the region and must be associated with or have special knowledge of specific activities related to water quality control. Members of the Regional Board serve without pay and conduct their business at regular meetings and frequent public hearings where public participation is encouraged.

The Regional Board's overall mission is to protect surface waters and groundwaters of the San Francisco region. The Regional Board carries out its mission by:

- Addressing regionwide water quality concerns through the creation and triennial update of a Water Quality Control Plan (Basin Plan);
- Preparing new or revised policies addressing regionwide water quality concerns;
- Adopting, monitoring compliance with, and enforcing waste discharge requirements and National Pollutant Discharge Elimination System (NPDES) permits;
- Providing recommendations to the State Board on financial assistance programs, proposals for water diversion, budget development, and other statewide programs and policies;
- Coordinating with other public agencies that are concerned with water quality control; and
- Informing and involving the public on water quality issues.

WATER QUALITY CONTROL PLAN

By law, the Regional Board is required to develop, adopt (after public hearing), and implement a Water Quality Control Plan (Basin Plan) for the San Francisco Bay region. The Basin Plan is the master policy document that contains descriptions of the legal, technical, and programmatic bases of water quality regulation in the San Francisco

Bay region. The plan must include:

- A statement of beneficial water uses that the Regional Board will protect;
- The water quality objectives needed to protect the designated beneficial water uses; and
- The strategies and time schedules for achieving the water quality objectives.

The Regional Board first adopted a plan for waters inland from the Golden Gate in 1968. After several revisions, the first comprehensive Water Quality Control Plan for the region was adopted by the Regional Board and approved by the State Board in April 1975. Subsequently, major revisions were adopted in 1982, 1986, 1992, and 1995. Each proposed amendment to the Basin Plan is subject to an extensive public review process. The Regional Board must then adopt the amendment, which is then subject to approval by the State Board. In most cases, the Office of Administrative Law and the U.S. Environmental Protection Agency (U.S. EPA) must approve the amendment as well.

The basin planning process drives the Regional Board's effort to manage water quality. The Basin Plan provides a definitive program of actions designed to preserve and enhance water quality and to protect beneficial uses in a manner that will result in maximum benefit to the people of California. The Basin Plan fulfills the following needs:

- The U.S. Environmental Protection Agency requires such a plan in order to allocate federal grants to cities and districts for construction of wastewater treatment facilities.
- The Plan provides a basis for establishing priorities as to how both state and federal grants are disbursed for constructing and upgrading wastewater treatment facilities.
- The Plan fulfills the requirements of the Porter-Cologne Act that call for water quality control plans in California.
- The Plan, by defining the resources, services, and qualities of aquatic ecosystems to be maintained, provides a basis for the Regional Board to establish or revise waste discharge requirements and for the State Board to establish or revise water rights permits.
- The Plan establishes conditions (discharge prohibitions) that must be met at all times.

The intent of this comprehensive planning effort is to provide positive and firm direction for future water quality control. However, adequate provision must be made for changing conditions and technology. The Regional Board will review the Basin Plan at least once every three years. Unlike traditional plans, which often become obsolete within a few years after their preparation, the Basin Plan is updated as deemed necessary to maintain pace with technological, hydrological, political, and physical changes in the region.

WATERSHED MANAGEMENT PLANNING

The Regional Board has administered the NPDES program for nearly two decades to control municipal and industrial wastewater discharges. At the same time, however, urban and agricultural runoff have continued, for the most part unchecked. Stormwater runoff now contributes much of the pollutant loading to rivers, streams, bays, lakes, and lagoons in the San Francisco Bay region. Over the next few years, the Regional Board will focus a significant amount of effort on controlling pollution from urban and agricultural runoff. The emphasis will be on preventing pollution before it occurs by managing resources more carefully, as opposed to cleaning up pollution after the fact.

To help accomplish this goal, the Regional Board is initiating watershed management planning for several counties. The Regional Board firmly believes that watershed planning and protection efforts will not be effective unless solutions are defined and implemented at the local level. An effective watershed management plan will require formulating water quality goals and objectives for watershed protection and enhancement, then committing to specific tasks that will eventually allow the objectives, and ultimately the goals, to be met. Tasks could include a wide range of actions, such as improving coordination between regulatory and permitting agencies, increasing citizen participation in watershed planning activities, improving public education on water quality and protection issues, and enforcing current regulations on a more consistent basis.

THE SAN FRANCISCO ESTUARY PROJECT

The Regional Board has been an active participant in the San Francisco Estuary Project, a cooperative program aimed at promoting effective, environmentally sound management

2 BENEFICIAL USES

INTRODUCTION

State policy for water quality control in California is directed toward achieving the highest water quality consistent with maximum benefit to the people of the state. Aquatic ecosystems and underground aquifers provide many different benefits to the people of the state. The beneficial uses described in detail in this chapter define the resources, services, and qualities of these aquatic systems that are the ultimate goals of protecting and achieving high water quality. The Regional Board is charged with protecting all these uses from pollution and nuisance that may occur as a result of waste discharges in the region. Beneficial uses of surface waters, groundwaters, marshes, and mudflats presented here serve as a basis for establishing water quality objectives and discharge prohibitions to attain this goal.

DEFINITIONS OF BENEFICIAL USES

The following definitions (in *italic*) for beneficial uses are applicable throughout the entire state. A brief description of the most important water quality requirements for each beneficial use follows each definition (in alphabetical order by abbreviation).

(AGR) AGRICULTURAL SUPPLY

Uses of water for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

The criteria discussed under municipal and domestic water supply (MUN) also effectively protect farmstead uses. To establish water quality criteria for livestock water supply, the Regional Board must consider the relationship of water to the total diet, including water freely drunk, moisture content of feed, and interactions between irrigation water quality and feed quality. The University of California Cooperative Extension has developed threshold and limiting concentrations for livestock and irrigation water.

Continued irrigation often leads to one or more of four types of hazards related to water quality and the nature of soils and crops. These hazards are (1) soluble salt accumulations, (2) chemical changes in the soil, (3) toxicity to crops, and (4) potential disease transmission to humans through reclaimed water use. Irrigation water classification systems, arable soil classification systems, and public health criteria related to reuse of wastewater have been developed with consideration given to these hazards.

(ASBS) AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE

Areas designated by the State Water Resources Control Board.

These include marine life refuges, ecological reserves, and designated areas where the preservation and enhancement of natural resources requires special protection. In these areas, alteration of natural water quality is undesirable. The areas that have been designated as ASBS in this region are depicted in Figure 2-1. The State Ocean Plan (see Chapter 5) requires wastes to be discharged at a sufficient distance from these areas to assure maintenance of natural water quality conditions.

(COLD) COLD FRESHWATER HABITAT

Uses of water that support cold water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold freshwater habitats generally support trout and may support the anadromous salmon and steelhead fisheries as well. Cold water habitats are commonly well-oxygenated. Life within these waters is relatively intolerant to environmental stresses. Often, soft waters feed cold water habitats. These waters render fish more susceptible to toxic metals, such as copper, because of their lower buffering capacity.

QUICK INDEX PAGE

(COMM) OCEAN, COMMERCIAL, AND SPORT FISHING

Uses of water for commercial or recreational collection of fish, shellfish, or other organisms in oceans, bays, and estuaries, including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

To maintain ocean fishing, the aquatic life habitats where fish reproduce and seek their food must be protected. Habitat protection is under descriptions of other beneficial uses.

(EST) ESTUARINE HABITAT

Uses of water that support estuarine ecosystems, including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds), and the propagation, sustenance, and migration of estuarine organisms.

Estuarine habitat provides an essential and unique habitat that serves to acclimate anadromous fishes (salmon, striped bass) migrating into fresh or marine water conditions. The protection of estuarine habitat is contingent upon (1) the maintenance of adequate Delta outflow to provide mixing and salinity control; and (2) provisions to protect wildlife habitat associated with marshlands and the Bay periphery (i.e., prevention of fill activities). Estuarine habitat is generally associated with moderate seasonal fluctuations in dissolved oxygen, pH, and temperature and with a wide range in turbidity.

(FRSH) FRESHWATER REPLENISHMENT

Uses of water for natural or artificial maintenance of surface water quantity or quality.

(GWR) GROUNDWATER RECHARGE

Uses of water for natural or artificial recharge of groundwater for purposes of future extraction, maintenance of water quality, or halting saltwater intrusion into freshwater aquifers.

The requirements for groundwater recharge operations generally reflect the future use to be made of the water stored underground. In some cases, recharge operations may be conducted to prevent seawater intrusion. In these cases, the quality of recharged waters may not directly affect quality at the wellfield being protected. Recharge operations are often limited by excessive suspended sediment or turbidity that can clog the surface of recharge pits, basins, or wells.

Under the state Antidegradation Policy, the quality of some of the waters of the state is higher than established by adopted policies. It is the intent of this policy to maintain that existing higher quality to the maximum extent possible.

Requirements for groundwater recharge, therefore, shall impose the Best Available Technology (BAT) or Best Management Practices (BMPs) for control of the discharge as necessary to assure the highest quality consistent with maximum benefit to the people of the state. Additionally, it must be recognized that groundwater recharge occurs naturally in many areas from streams and reservoirs. This recharge may have little impact on the quality of groundwaters under normal circumstances, but it may act to transport pollutants from the recharging water body to the groundwater. Therefore, groundwater recharge must be considered when requirements are established.

(IND) INDUSTRIAL SERVICE SUPPLY

Uses of water for industrial activities that do not depend primarily on water quality, including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

Most industrial service supplies have essentially no water quality limitations except for gross constraints, such as freedom from unusual debris.

(MAR) MARINE HABITAT

Uses of water that support marine ecosystems, including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

In many cases, the protection of marine habitat will be accomplished by measures that protect wildlife habitat generally, but more stringent criteria may be necessary for waterfowl marshes and other habitats, such as those for shellfish and marine fishes. Some marine habitats, such as important intertidal zones and kelp beds, may require special protection.

(MIGR) FISH MIGRATION

Uses of water that support habitats necessary for migration, acclimatization between fresh water and salt water, and protection of aquatic organisms that are temporary inhabitants of waters within the region.

The water quality provisions acceptable to cold water fish generally protect anadromous

fish as well. However, particular attention must be paid to maintaining zones of passage. Any barrier to migration or free movement of migratory fish is harmful. Natural tidal movement in estuaries and unimpeded river flows are necessary to sustain migratory fish and their offspring. A water quality barrier, whether thermal, physical, or chemical, can destroy the integrity of the migration route and lead to the rapid decline of dependent fisheries.

Water quality may vary through a zone of passage as a result of natural or human-induced activities. Fresh water entering estuaries may float on the surface of the denser salt water or hug one shore as a result of density differences related to water temperature, salinity, or suspended matter.

(MUN) MUNICIPAL AND DOMESTIC SUPPLY

Uses of water for community, military, or individual water supply systems, including, but not limited to, drinking water supply.

The principal issues involving municipal water supply quality are (1) protection of public health; (2) aesthetic acceptability of the water; and (3) the economic impacts associated with treatment- or quality-related damages.

The health aspects broadly relate to: direct disease transmission, such as the possibility of contracting typhoid fever or cholera from contaminated water; toxic effects, such as links between nitrate and methemoglobinemia (blue babies); and increased susceptibility to disease, such as links between halogenated organic compounds and cancer.

Aesthetic acceptance varies widely depending on the nature of the supply source to which people have become accustomed. However, the parameters of general concern are excessive hardness, unpleasant odor or taste, turbidity, and color. In each case, treatment can improve acceptability although its cost may not be economically justified when alternative water supply sources of suitable quality are available.

Published water quality objectives give limits for known health-related constituents and most properties affecting public acceptance. These objectives for drinking water include the U.S. Environmental Protection Agency Drinking Water Standards and the California State Department of Health Services criteria.

(NAV) NAVIGATION

Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.

(PRO) INDUSTRIAL PROCESS SUPPLY

Uses of water for industrial activities that depend primarily on water quality.

Water quality requirements differ widely for the many industrial processes in use today. So many specific industrial processes exist with differing water quality requirements that no meaningful criteria can be established generally for quality of raw water supplies. Fortunately, this is not a serious shortcoming, since current water treatment technology can create desired product waters tailored for specific uses.

(RARE) PRESERVATION OF RARE AND ENDANGERED SPECIES

Uses of waters that support habitats necessary for the survival and successful maintenance of plant or animal species established under state and/or federal law as rare, threatened, or endangered.

The water quality criteria to be achieved that would encourage development and protection of rare and endangered species should be the same as those for protection of fish and wildlife habitats generally. However, where rare or endangered species exist, special control requirements may be necessary to assure attainment and maintenance of particular quality criteria, which may vary slightly with the environmental needs of each particular species. Criteria for species using areas of special biological significance should likewise be derived from the general criteria for the habitat types involved, with special management diligence given where required.

(REC1) WATER CONTACT RECREATION

Uses of water for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, and uses of natural hot springs.

Water contact implies a risk of waterborne disease transmission and involves human health; accordingly, criteria required to protect this use are more stringent than those for more casual water-oriented recreation.

Excessive algal growth has reduced the value of shoreline recreation areas in some cases, particularly for swimming. Where algal growths exist in nuisance proportions, particularly bluegreen algae, all recreational water uses, including fishing, tend to suffer.

One criterion to protect the aesthetic quality of waters used for recreation from excessive algal growth is based on chlorophyll a.

(REC2) NONCONTACT WATER RECREATION

Uses of water for recreational activities involving proximity to water, but not normally involving contact with water where water ingestion is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Water quality considerations relevant to noncontact water recreation, such as hiking, camping, or boating, and those activities related to tide pool or other nature studies require protection of habitats and aesthetic features. In some cases, preservation of a natural wilderness condition is justified, particularly when nature study is a major dedicated use.

One criterion to protect the aesthetic quality of waters used for recreation from excessive algal growth is based on chlorophyll a.

(SHELL) SHELLFISH HARVESTING

Uses of water that support habitats suitable for the collection of crustaceans and filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes.

Shellfish harvesting areas require protection and management to preserve the resource and protect public health. The potential for disease transmission and direct poisoning of humans is of considerable concern in shellfish regulation. The bacteriological criteria for the open ocean, bays, and estuarine waters where shellfish cultivation and harvesting occur should conform with the standards described in the National Shellfish Sanitation Program, Manual of Operation.

Toxic metals can accumulate in shellfish. Mercury and cadmium are two metals known to have caused extremely disabling effects in humans who consumed shellfish that concentrated these elements from industrial waste discharges. Other elements, radioactive isotopes, and certain toxins produced by particular plankton species also concentrate in shellfish tissue. Documented cases of paralytic shellfish poisoning are not uncommon in California.

(SPWN) FISH SPAWNING

Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Dissolved oxygen levels in spawning areas should ideally approach saturation levels. Free movement of water is essential to maintain well-oxygenated conditions around eggs deposited in sediments. Water temperature, size distribution and organic content of sediments, water depth, and current velocity are also important determinants of spawning area adequacy.

(WARM) WARM FRESHWATER HABITAT

Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

The warm freshwater habitats supporting bass, bluegill, perch, and other panfish are generally lakes and reservoirs, although some minor streams will serve this purpose where stream flow is sufficient to sustain the fishery. The habitat is also important to a variety of nonfish species, such as frogs, crayfish, and insects, which provide food for fish and small mammals. This habitat is less sensitive to environmental changes, but more diverse than the cold freshwater habitat, and natural fluctuations in temperature, dissolved oxygen, pH, and turbidity are usually greater.

(WILD) WILDLIFE HABITAT

Uses of waters that support wildlife habitats, including, but not limited to, the preservation and enhancement of vegetation and prey species used by wildlife, such as waterfowl.

The two most important types of wildlife habitat are riparian and wetland habitats. These habitats can be threatened by development, erosion, and sedimentation, as well as by poor water quality.

The water quality requirements of wildlife pertain to the water directly ingested, the aquatic habitat itself, and the effect of water quality on the production of food materials. Waterfowl habitat is particularly sensitive to changes in water quality. Dissolved oxygen, pH, alkalinity, salinity, turbidity, settleable

matter, oil, toxicants, and specific disease organisms are water quality characteristics particularly important to waterfowl habitat.

Dissolved oxygen is needed in waterfowl habitats to suppress development of botulism organisms; botulism has killed millions of waterfowl. It is particularly important to maintain adequate circulation and aerobic conditions in shallow fringe areas of ponds or reservoirs where botulism has caused problems.

PRESENT AND POTENTIAL BENEFICIAL USES

SURFACE WATERS

Surface waters in the region consist of freshwater rivers, streams, and lakes (collectively described as inland surface waters), estuarine waters, and coastal waters. Estuarine waters are comprised of the Bay system from the Golden Gate to the regional boundary near Pittsburg and the lower portions of streams flowing into the Bay, such as the Napa and Petaluma rivers in the north and Coyote and San Francisquito creeks in the south.

Inland surface waters support or could support most of the beneficial uses described above. The specific beneficial uses for inland streams include municipal and domestic supply, agricultural supply, industrial process supply, groundwater recharge, water contact recreation, noncontact water recreation, wildlife habitat, cold freshwater habitat, warm freshwater habitat, fish migration, and fish spawning. The San Francisco Bay Estuary supports estuarine habitat, industrial service supply, and navigation in addition to all of the uses supported by streams.

Coastal waters' beneficial uses include water contact recreation; noncontact water recreation; industrial service supply; navigation; marine habitat; shellfish harvesting; ocean, commercial and sport fishing; and preservation of rare and endangered species. In addition, the California coastline within the San Francisco Bay Basin is endowed with exceptional scenic beauty.

Beneficial uses of each significant water body have been identified and are organized according to the seven major watersheds within the region (Figure 2-2). The maps locating each water body (Figures 2-3 through 2-9) and tables keyed to each map (Tables 2-1 through 2-7) describing associated present and potential beneficial uses were produced using a geographical information system (GIS) at the Regional Board. More detailed representations of each location can be created using this computerized version.

The beneficial uses of any specifically identified water body generally apply to all its tributaries. In some cases a beneficial use may not be applicable to the entire body of water, such as navigation in Calabazas Creek or shellfish harvesting in the Pacific Ocean. In these cases, the Regional Board's judgment regarding water quality control measures necessary to protect beneficial uses will be applied.

GROUNDWATERS

Groundwater is defined as subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated. Where groundwater occurs in a saturated geologic unit that contains sufficient permeable thickness to yield significant quantities of water to wells and springs, it can be defined as an aquifer. A groundwater basin is defined as a hydrogeologic unit containing one large aquifer or several connected and interrelated aquifers.

Water-bearing geologic units occur within groundwater basins in the region that do not meet the definition of an aquifer. For instance, there are shallow, low permeability zones throughout the region that have extremely low water yields. Groundwater may also occur outside of currently identified basins. Therefore, for basin planning purposes, the term "groundwater" includes all subsurface waters, whether or not these waters meet the classic definition of an aquifer or occur within identified groundwater basins.

The areal extent of groundwater basins in the region has been evaluated by the Department of Water Resources (DWR) (Bulletin 118, 1980). Of special importance to the region are the 31 groundwater basins classified by DWR that produce, or potentially could produce, significant amounts of groundwater. Table 2-8 summarizes the hydrogeologic characteristics of basins depicted in Figure 2-10. This computer groundwater mapping GIS system was developed by the Regional Board and has the capacity to present information on each basin at a much higher level of resolution.

Existing and potential beneficial uses applicable to groundwater in the region include municipal and domestic water supply (MUN), industrial water supply (IND), industrial process water supply (PROC), agricultural water supply (AGR), and freshwater replenishment to surface waters (FRESH). Table 2-9 lists the 31 identified groundwater basins located in the region and their existing and potential beneficial uses.

Unless otherwise designated by the Regional Board, all groundwaters are considered

suitable, or potentially suitable, for municipal or domestic water supply (MUN). In making any exceptions, the Regional Board will consider the criteria referenced in Regional Board Resolution No. 89-39, "Sources of Drinking Water," where:

- The total dissolved solids exceed 3,000 mg/l (5,000 µS/cm, electrical conductivity), and it is not reasonably expected by the Regional Board that the groundwater could supply a public water system; or
- There is contamination, either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices or best economically achievable treatment practices; or
- The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day; or
- The aquifer is regulated as a geothermal energy-producing source or has been exempted administratively pursuant to 40 CFR Part 146.4 (revised April 1, 1983) for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR Part 261.3 (revised October 30, 1992).

WETLANDS

Federal administrative law (e.g., 40 CFR Part 122.2, revised December 22, 1993) defines wetlands as waters of the United States. National waters include waters of the State of California, defined by the Porter-Cologne Act as "any water, surface or underground, including saline waters, within the boundaries of the State." (CWC §13050[e]). Wetlands water quality control is therefore clearly within the jurisdiction of the State and Regional Boards.

Wetlands are further defined in 40 CFR 122.2 as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

The Regional Board recognizes that wetlands frequently include areas commonly referred to as saltwater marshes, freshwater marshes, open or closed brackish water marshes, mudflats, sandflats, unvegetated seasonally ponded areas, vegetated shallows, sloughs, wet meadows, playa lakes, natural ponds, vernal pools, diked baylands, seasonal wetlands, and riparian woodlands.

Mudflats make up one of the largest and most important habitat types in the San Francisco Estuary. Snails, clams, worms, and other animals convert the rich organic matter in the mud bottom to food for fish, crabs, and birds. Mudflats generally support a variety of edible shellfish, and many species of fish rely heavily on the mudflats during at least a part of their life cycle. Additionally, San Francisco Bay mudflats are one of the most important habitats on the coast of California for millions of migrating shorebirds.

Another important characteristic of the San Francisco Estuary is the fresh, brackish, and salt water marshes around the Bay's margins. These highly complex communities are recognized as vital components of the Bay system's ecology. Most marshes around the Bay have been destroyed through filling and development. The protection, preservation, and restoration of the remaining marsh communities are essential for maintaining the ecological integrity of the San Francisco Estuary.

Identifying wetlands may be complicated by such factors as the seasonality of rainfall in the region. Therefore, in identifying wetlands, the Regional Board will consider such indicators as hydrology, hydrophytic plants, and/or hydric soils. The Regional Board will, in general, rely on the federal manual for wetlands delineation in this region for Section 404 permits (*Federal Manual for Identifying and Delineating Jurisdictional Wetlands*, 1989; U.S. Army Corps of Engineers, U.S. EPA, U.S. Fish and Wildlife Service, and U.S. Soil Conservation Service, Washington, D.C., Cooperative Technical Publication). In the rare cases where the U.S. EPA and Corps guidelines disagree, the Regional Board will rely on the wetlands delineation made by U.S. EPA or the California Department of Fish and Game.

There are many potential beneficial uses of wetlands, including Wildlife Habitat; Preservation of Rare and Endangered Species; Shellfish Harvesting; Water Contact Recreation; Noncontact Water Recreation; Ocean, Commercial, and Sport Fishing; Marine Habitat; Fish Migration; Fish Spawning; and Estuarine Habitat. Table 2-10 lists and specifies beneficial uses for 34 significant wetland areas within the region; generalized locations of these wetlands are shown in Figure 2-11.

It should be noted that most of the wetlands listed in Table 2-10 are saltwater marshes, and that the list is not comprehensive. The Regional Board is facilitating the preparation of a Regional Wetlands Management Plan (RWMP) that will identify and specify beneficial uses of many additional significant wetlands. Because of the large number of small and non-contiguous wetlands, it will probably not be practical to delineate and specify beneficial uses of every wetland area. Therefore, beneficial uses may be determined site specifically, as needed. Chapter 4 of this Plan contains additional information on the RWMP and on the process used to determine beneficial uses for specific wetland sites.

TABLE 2-8 GROUNDWATER BASIN CHARACTERISTICS [1]

GROUNDWATER BASIN	COUNTY	DWR BASIN NO.[2]	AREAL EXTENT (SQ. MI.)	DEPTH ZONE (FEET) [3]	STORAGE CAPACITY [4]	PERENNIAL YIELD [5]
Alameda Creek (Niles Cone)	Alameda	2 - 9.01	97.0	40 - >500[a]	1.3 mil[a]	32,600[a]
Castro Valley	Alameda	2 - 8	4.0	NA	NA	NA
East Bay Plain	Alameda	2 - 9.01	114.0	25 - 596[b]	2.77 mil[c]	NA
Livermore Valley	Alameda	2 - 10	170.0	0 - 500[d]	540,000[d]	13,500[e]
Sunol Valley	Alameda	2 - 11	28.0	160 - 500[f]	>2,800[g] ?	140[g] ?
Arroyo Del Hambre Valley	Contra Costa	2 - 31	2.0	NA	NA	NA
Clayton Valley	Contra Costa	2 - 5	30.0	50 - 300[h]	180,000[d] ?	NA
Pittsburg Plain	Contra Costa	2 - 4	30.0	50 - 160[h]	NA	NA
San Ramon Valley	Contra Costa	2 - 7	30.0	300 - 600[i]	NA	NA
Ygnacio Valley	Contra Costa	2 - 6	30.0	20 - 300[h]	50,000[h]	NA
Novato Valley	Marin	2 - 30	17.5	55 - 90[j]	NA	NA
Sand Point Area	Marin	2 - 27	2.0	20 - 300[k]	NA	NA
San Rafael	Marin	2 - 29	NA	NA	NA	NA
Ross Valley	Marin	2 - 28	18.0	10 - 60[l]	1380[l]	350[l]
Napa Valley	Napa	2 - 2 & 2 - 2.01	210.0	50 - 500[m]	240,000[n]	24,000[m]
Islais Valley	San Francisco	2 - 33	NA	NA	NA	NA
Merced Valley (North)	San Francisco	2 - 35	16.0	NA	NA	NA
San Francisco Sands	San Francisco	2 - 34	14.0	NA	NA	NA
Visitation Valley	San Francisco	2 - 32	7.5	NA	NA	NA
Half Moon Bay Terrace	San Mateo	2 - 22	25.0	20 - 15[o]	10,300[o]	2,200[o]
Merced Valley (South)	San Mateo	2 - 35A	16.0	250 - 745[p]	NA	NA
Pescadero Valley	San Mateo	2 - 26	2.0	NA	NA	NA
San Gregorio Valley	San Mateo	2 - 24	2.0	NA	NA	NA
San Mateo Plain	San Mateo	2 - 9A	32.5	100 - 500[q]	NA	NA
San Pedro Valley	San Mateo	2 - 36	2.0	NA	NA	NA
Santa Clara Valley (& Coyote)	Santa Clara	2 - 9B	240.0	10 - 1010[d]	3.0 mil[r]	100,000[r]
Suisun/Fairfield Valley	Solano	2 - 3	203.0	30 - 400[s,t]	40,000[t]	NA
Kenwood Valley	Sonoma	2 - 19	6.0	0 - 1000[d]	460,000[d]	NA
Petaluma Valley	Sonoma/Mrn.	2 - 1	41.0	0 - 900[d]	2.1 mil[d]	NA
Sebastopol-Merced Fm. Highlands	Sonoma	2 - 25	150.0	NA	NA	NA
Sonoma Valley	Sonoma	2 - 2.022	50.0	0 - 1000[d]	2.66 mil[d]	NA

NA - Not Available.

NOTES:

(1) Information compiled from DWR and local water management agencies. (References are listed below.)
(2) DWR Bulletin 118-80 (1980).
(3) Average depth to aquifers below land surface. These depths are provided for information only and cannot be used to characterize site-specific conditions.
(4) Total available storage in acre-feet. (References are listed below.)
(5) The average annual amount of groundwater that can be withdrawn without producing an undesired result. (References are listed below.)

REFERENCES:

a. Alameda County Water District Staff, 1992, Personal Communication.
b. Alameda County Flood Control and Water Conservation District, 1988, Geohydrology and Groundwater Quality Overview, East Bay Plain Area, 205(j) Report.
c. California Department of Water Resources, 1991, Groundwater Storage Capacity of the Alameda Bay Plain, Draft Report for Alameda Public Works Agency.
d. California Department of Water Resources, 1975, California's Groundwater, Bulletin 118.
e. U.S. Geological Survey, 1984, Water quality conditions and an evaluation of ground- and surface water based sampling in Livermore-Amador Valley, WRI 84-4352.
f. California Department of Water Resources, 1974, Evaluation of groundwater resources in the Livermore and Sunol Valleys, Bulletin 118-2.
g. California Department of Water Resources, 1963, Alameda County Investigation, Bulletin 13.
h. Contra Costa County Health Department, 1986, Small Community Water Systems.
i. California Department of Water Resources, 1964, Alameda Creek watershed above Niles; Chemical qualities of surface water, waste discharges and groundwater.
j. Blackie & Wond, Consulting Engineers, 1957, Report to the North Marin County Water District on Water Supply Development, Project Number 2.
k. Wallace, Roberts & Todd, 1988, Revised Draft Dillon Beach Community Plan, prepared for Marin County Planning Department.
l. Ellis, William C. and Associates, 1978, Groundwater resources of Ross Valley; A report on water planning investigations prepared for Marin Municipal Water District, Marin County, California.
m. Napa County Flood Control and Water Conservation District, 1991, Water Resource Study for Napa County Region.
n. U.S. Geological Survey, 1960, Geology and Groundwater in Napa and Sonoma Valleys, Water Supply Paper 1495.
o. Geoconsultants, Inc., 1991, Annual Report 1990-1991, Groundwater Resources, Half Moon Bay, California, prepared for the City of Half Moon Bay.
p. Applied Consultants, 1991, Report on the Daly City Groundwater Investigation and Model Study, prepared for Daly City.
q. University of California, Berkeley, Sanitary Engineering and Environmental Health Research Laboratory, 1987, San Francisco Bay Region Groundwater Resource Study Volume 10 - San Mateo Ground Water Basin Characteristics, SEEHRL Report No. 87-8/10.
r. Santa Clara Valley Water District, 1975, Master Plan - expansion of in-county water distribution system.
s. University of California, Berkeley, Sanitary Engineering and Environmental Health Research Laboratory, 1987, San Francisco Bay Region Groundwater Resource Study Volume 6 - Suisun/Fairfield Ground Water Basin Characteristics, SEEHRL Report No. 87-8/6.
t. U.S. Geological Survey, 1960, Geology, Water Resources, and Usable Groundwater Storage Capacity of part of Solano County, California, Water Supply Paper 1464.

TABLE 2-9 EXISTING AND POTENTIAL BENEFICIAL USES OF GROUNDWATER IN IDENTIFIED BASINS

GROUNDWATER BASIN	COUNTY	DWR BASIN NO.	MUN[1]	PROC[2]	IND[3]	AGR[4]	FRESH[5]
Alameda Creek (Niles Cone)	Alameda	2 - 9.01	E[6]	E	E	E	
Castro Valley	Alameda	2 - 8	P[7]	P	P	P	
East Bay Plain	Alameda	2 - 9.01	E	E	E	E	
Livermore Valley	Alameda	2 - 10	E	E	E	E	
Sunol Valley	Alameda	2 - 11	E	E	E	E	
Arroyo Del Hambre Valley	Contra Costa	2 - 31	P	P	P	P	
Clayton Valley	Contra Costa	2 - 5	E	P	P	P	
Pittsburg Plain	Contra Costa	2 - 4	P	P	P	P	
San Ramon Valley	Contra Costa	2 - 7	E	P	P	E	
Ygnacio Valley	Contra Costa	2 - 6	P	P	P	P	
Novato Valley	Marin	2 - 30	P	P	P	P	
Sand Point Area	Marin	2 - 27	E	P	P	P	
San Rafael	Marin	2 - 29	P	P	P	P	
Ross Valley	Marin	2 - 28	E	P	P	E	
Napa Valley	Napa	2.2 & 2 - 2.01	E	E	E	E	
Islais Valley	San Francisco	2 - 33	P	E	E	P	
Merced Valley (North)	San Francisco	2 - 35	P	P	P	E	
San Francisco Sands	San Francisco	2 - 34	E	P	P	E	
Visitation Valley	San Francisco	2 - 32	P	E	E	P	
Half Moon Bay Terrace	San Mateo	2 - 22	E	P	P	E	
Merced Valley (South)	San Mateo	2 - 35A	E	P	P	E	
Pescadero Valley	San Mateo	2 - 26	E	P	P	E	
San Gregorio Valley	San Mateo	2 - 24	E	P	P	E	
San Mateo Plain	San Mateo	2 - 9A	E	E	E	P	
San Pedro Valley	San Mateo	2 - 36	P	P	P	P	
Santa Clara Valley (& Coyote)	Santa Clara	2 - 9B	E	E	E	E	
Suisun/Fairfield Valley	Solano	2 - 3	E	E	E	E	
Kenwood Valley	Sonoma	2 - 19	E	P	P	E	
Petaluma Valley	Sonoma	2 - 1	E	P	P	E	
Sebastopol-Merced Fm. Highlands	Sonoma	2 - 25	E	P	P	E	
Sonoma Valley	Sonoma	2 - 2.022	E	P	P	E	

NOTES:
(1) MUN = Municipal and domestic water supply.
(2) PROC = Industrial process water supply.
(3) IND = Industrial service water supply.
(4) AGR = Agricultural water supply.
(5) FRESH = Freshwater replenishment to surface water. (Designation will be determined at a later date; for the interim, a site-by-site determination will be made).
(6) E = Existing beneficial use; based on available information (see references listed in Table 2-8).
(7) P = Potential beneficial use; based on available information. There is no known use of the basin for this category; however, the basin could be used for this purpose (see references listed in Table 2-8).

TABLE 2-10 BENEFICIAL USES OF WETLAND AREAS[a]

BASIN/MARSH AREA	WETLAND TYPES FRESH	WETLAND TYPES BRACKISH	BENEFICIAL USES EST	MAR	MIGR	COMM	RARE	REC 1	REC 2	SALT	SPWN	WILD
ALAMEDA COUNTY												
Arrowhead			●				●	●	●	●	●	●
Coyote Hills			●				●	●	●	●	●	●
Emeryville Crescent			●				●	●	●	●	●	●
Hayward			●					●	●	●	●	●
CONTRA COSTA COUNTY												
North Contra Costa		●	●				●	●	●	●	●	●
Point Edith		●	●				●		●		●	●
San Pablo Creek			●				●	●	●	●	●	●
Wildcat Creek			●				●	●	●		●	●
MARIN COUNTY												
Abbotts Lagoon				●				●	●	●		●
Bolinas Lagoon				●				●	●	●		●
Corte Madera			●				●	●	●	●	●	●
Drakes Estero								●	●	●	●	●
Gallinas Creek		●	●				●	●	●	●	●	●
Limantour Estero				●				●	●	●		●
Corte Madera Ecological Reserve			●					●	●	●		●
Novato Creek		●	●		●		●	●	●	●	●	
Richardson Bay			●				●	●	●	●	●	●
Rodeo Lagoon				●				●	●	●		●
San Pedro		●	●			●	●		●	●	●	●
San Rafael Creek		●	●				●	●	●	●		●
Tomales Bay				●	●			●	●	●	●	●
NAPA COUNTY												
Mare Island			●						●	●		●
Napa		●	●		●	●	●	●	●		●	
San Pablo Bay			●		●	●	●	●	●	●	●	●
SAN MATEO COUNTY												
Bair Island			●				●	●	●	●		●
Belmont Slough			●				●	●	●	●	●	●
Pescadero	●			●	●		●	●	●	●	●	●
Princeton		●						●	●	●		●
Redwood City Area			●				●	●	●			●
SANTA CLARA COUNTY												
South San Francisco Bay			●		●	●	●	●	●	●	●	●
SOLANO COUNTY												
Southhampton Bay			●				●	●	●	●	●	●
Suisun	●	●	●		●		●	●	●		●	●
White Slough			●		●		●	●	●	●	●	●
SONOMA COUNTY												
Petaluma		●	●		●	●	●	●	●		●	●

NOTE:
a. General locations of wetlands areas are depicted in Figure 2-11.

3 WATER QUALITY OBJECTIVES

INTRODUCTION

The overall goals of water quality regulation are to protect and maintain thriving aquatic ecosystems and the resources those systems provide to society and to accomplish these in an economically and socially sound manner. California's regulatory framework uses water quality objectives both to define appropriate levels of environmental quality and to control activities that can adversely affect aquatic systems.

WATER QUALITY OBJECTIVES

There are two types of objectives: narrative and numerical. Narrative objectives present general descriptions of water quality that must be attained through pollutant control measures and watershed management. They also serve as the basis for the development of detailed numerical objectives.

Historically, numerical objectives were developed primarily to limit the adverse effect of pollutants in the water column. Two decades of regulatory experience and extensive research in environmental science have demonstrated that beneficial uses are not fully protected unless pollutant levels in all parts of the aquatic system are also monitored and controlled. The Regional Board is actively working towards an integrated set of objectives, including numerical sediment objectives, that will ensure the protection of all current and potential beneficial uses.

Numerical objectives typically describe pollutant concentrations, physical/chemical conditions of the water itself, and the toxicity of the water to aquatic organisms. These objectives are designed to represent the maximum amount of pollutants that can remain in the water column without causing any adverse effect on organisms using the aquatic system as habitat, on people consuming those organisms or water, and on other current or potential beneficial uses (as described in Chapter 2).

The technical bases of the region's water quality objectives include extensive biological, chemical, and physical partitioning information reported in the scientific literature, national water quality criteria, studies conducted by other agencies, and information gained from local environmental and discharge monitoring (as described in Chapter 6). The Regional Board recognizes that limited information exists in some cases, making it difficult to establish definitive numerical objectives, but the Regional Board believes its conservative approach to setting objectives has been proper. In addition to the technical review, the overall feasibility of reaching objectives in terms of technological, institutional, economic, and administrative factors is considered at many different stages of objective derivation and implementation of the water quality control plan.

Together, the narrative and numerical objectives define the level of water quality that shall be maintained within the region. In instances where water quality is better than that prescribed by the objectives, the state Antidegradation Policy applies (State Board Resolution 68-16: Statement of Policy With Respect to Maintaining High Quality of Waters in California). This policy is aimed at protecting relatively uncontaminated aquatic systems where they exist and preventing further degradation.

When uncontrollable water quality factors result in the degradation of water quality beyond the levels or limits established herein as water quality objectives, the Regional Board will conduct a case-by-case analysis of the benefits and costs of preventing further degradation. In cases where this analysis indicates that beneficial uses will be adversely impacted by allowing further degradation, then the Regional Board will not allow controllable water quality factors to cause any further degradation of water quality. Controllable water quality factors are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the state and that may be reasonably controlled.

QUICK INDEX PAGE

The Regional Board establishes and enforces waste discharge requirements for point and nonpoint source of pollutants at levels necessary to meet numerical and narrative water quality objectives. In setting waste discharge requirements, the Regional Board will consider, among other things, the potential impact on beneficial uses within the area of influence of the discharge, the existing quality of receiving waters, and the appropriate water quality objectives.

In general, the objectives are intended to govern the concentration of pollutant constituents in the main water mass. The same objectives cannot be applied at or immediately adjacent to submerged effluent discharge structures. Zones of initial dilution within which higher concentrations can be tolerated will be allowed for such discharges.

For a submerged buoyant discharge, characteristic of most municipal and industrial wastes that are released from submerged outfalls, the momentum of the discharge and its initial buoyancy act together to produce turbulent mixing. Initial dilution in this case is completed when the diluting wastewater ceases to rise in the water column and first begins to spread horizontally.

For shallow water submerged discharges, surface discharges, and nonbuoyant discharges, characteristic of cooling water wastes and some individual discharges, turbulent mixing results primarily from the momentum of discharge. Initial dilution, in these cases, is considered to be completed when the momentum-induced velocity of the discharge ceases to produce significant mixing of the waste, or the diluting plume reaches a fixed distance from the discharge to be specified by the Regional Board, whichever results in the lower estimate for initial dilution.

Compliance with water quality objectives may be prohibitively expensive or technically impossible in some cases. The Regional Board will consider modification of specific water quality objectives as long as the discharger can demonstrate that the alternate objective will protect existing beneficial uses, is scientifically defensible, and is consistent with the state Antidegradation Policy. This exception clause properly indicates that the Regional Board will conservatively compare benefits and costs in these cases because of the difficulty in quantifying beneficial uses.

These water quality objectives are considered necessary to protect the present and potential beneficial uses described in Chapter 2 of this Plan and to protect existing high quality waters of the state. These objectives will be achieved primarily through establishing and enforcing waste discharge requirements and by implementing this water quality control plan.

OBJECTIVES FOR OCEAN WATERS

The provisions of the State Board's "Water Quality Control Plan for Ocean Waters of California" (Ocean Plan) and "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" (Thermal Plan) and any revision to them will apply to ocean waters. These plans describe objectives and effluent limitations for ocean waters.

OBJECTIVES FOR SURFACE WATERS

The following objectives apply to all surface waters within the region, except the Pacific Ocean.

BACTERIA

Table 3-I provides a summary of the bacterial water quality objectives and identifies the sources of those objectives. Table 3--2 summarizes U.S. EPA's water quality criteria for water contact recreation based on the frequency of use a particular area receives. These criteria will be used to differentiate between pollution sources or to supplement objectives for water contact recreation.

BIOACCUMULATION

Many pollutants can accumulate on particles, in sediment, or bioaccumulate in fish and other aquatic organisms. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.

BIOSTIMULATORY SUBSTANCES

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses. Changes in chlorophyll a and associated phytoplankton communities follow complex dynamics that are sometimes associated with a discharge of biostimulatory substances. Irregular and extreme levels of chlorophyll a

or phytoplankton blooms may indicate exceedance of this objective and require investigation.

COLOR

Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.

DISSOLVED OXYGEN

For all tidal waters, the following objectives shall apply:

In the Bay:

Downstream of
Carquinez Bridge.....5.0 mg/l minimum

Upstream of
Carquinez Bridge.....7.0 mg/l minimum

For nontidal waters, the following objectives shall apply:

Waters designated as:

Cold water habitat.....7.0 mg/l minimum

Warm water habitat.....5.0 mg/l minimum

The median dissolved oxygen concentration for any three consecutive months shall not be less than 80 percent of the dissolved oxygen content at saturation.

Dissolved oxygen is a general index of the state of the health of receiving waters. Although minimum concentrations of 5 mg/l and 7 mg/l are frequently used as objectives to protect fish life, higher concentrations are generally desirable to protect sensitive aquatic forms. In areas unaffected by waste discharges, a level of about 85 percent of oxygen saturation exists. A three-month median objective of 80 percent of oxygen saturation allows for some degradation from this level, but still requires a consistently high oxygen content in the receiving water.

FLOATING MATERIAL

Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.

OIL AND GREASE

Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.

POPULATION AND COMMUNITY ECOLOGY

All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce significant alterations in population or community ecology or receiving water biota. In addition, the health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

pH

The pH shall not be depressed below 6.5 nor raised above 8.5. This encompasses the pH range usually found in waters within the basin. Controllable water quality factors shall not cause changes greater than 0.5 units in normal ambient pH levels.

SALINITY

Controllable water quality factors shall not increase the total dissolved solids or salinity of waters of the state so as to adversely affect beneficial uses, particularly fish migration and estuarine habitat.

SEDIMENT

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Controllable water quality factors shall not cause a detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life.

SETTLEABLE MATERIAL

Waters shall not contain substances in concentrations that result in the deposition of material that cause nuisance or adversely affect beneficial uses.

SUSPENDED MATERIAL

Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

SULFIDE

All water shall be free from dissolved sulfide concentrations above natural background levels. Sulfide occurs in Bay muds as a result of bacterial action on organic matter in an anaerobic environment.

Concentrations of only a few hundredths of a milligram per liter can cause a noticeable odor or be toxic to aquatic life. Violation of the sulfide objective will reflect violation of dissolved oxygen objectives as sulfides cannot exist to a significant degree in an oxygenated environment.

TASTES AND ODORS

Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, that cause nuisance, or that adversely affect beneficial uses.

TEMPERATURE

Temperature objectives for enclosed bays and estuaries are as specified in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California," including any revisions to the plan.

In addition, the following temperature objectives apply to surface waters:

- The natural receiving water temperature of inland surface waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.
- The temperature of any cold or warm freshwater habitat shall not be increased by more than 5°F (2.8°C) above natural receiving water temperature.

TOXICITY

All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms. Detrimental responses include, but are not limited to, decreased growth rate and decreased reproductive success of resident or indicator species. There shall be no acute toxicity in ambient waters. Acute toxicity is defined as a median of less than 90 percent survival, or less than 70 percent survival, 10 percent of the time, of test organisms in a 96-hour static or continuous flow test.

There shall be no chronic toxicity in ambient waters. Chronic toxicity is a detrimental biological effect on growth rate, reproduction, fertilization success, larval development, population abundance, community composition, or any other relevant measure of the health of an organism, population, or community.

Chronic toxicity generally results from exposures to pollutants exceeding 96 hours. However, chronic toxicity may also be detected through short-term exposure of critical life stages of organisms.

As a minimum, compliance will be evaluated using the bioassay requirements contained in Chapter 4.

The health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

TURBIDITY

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases from normal background light penetration or turbidity relatable to waste discharge shall not be greater than 10 percent in areas where natural turbidity is greater than 50 NTU.

UN-IONIZED AMMONIA

The discharge of wastes shall not cause receiving waters to contain concentrations of un-ionized ammonia in excess of the following limits (in mg/l as N):

Annual Median 0.025

Maximum, Central Bay (as depicted in Figure 2-5) and upstream 0.16

Maximum, Lower Bay (as depicted in Figures 2-6 and 2-7) 0.4

The intent of this objective is to protect against the chronic toxic effects of ammonia in the receiving waters. An ammonia objective is needed for the following reasons:

- Ammonia (specifically un-ionized ammonia) is a demonstrated toxicant. Ammonia is generally accepted as one of the principle toxicants in municipal waste discharges. Some industries also discharge significant quantities of ammonia.
- Exceptions to the effluent toxicity limitations in Chapter 4 of the Plan allow for the discharge of ammonia in toxic amounts. In most instances, ammonia will be diluted or degraded to a nontoxic state fairly rapidly. However, this does not occur in all cases, the South Bay being a notable example. The ammonia limit is recommended in order to preclude any build up of ammonia in the receiving water.

- A more stringent maximum objective is desirable for the northern reach of the Bay for the protection of the migratory corridor running through Central Bay, San Pablo Bay, and upstream reaches.

OBJECTIVES FOR SPECIFIC CHEMICAL CONSTITUENTS

Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use. Water quality objectives for selected toxic pollutants developed in 1986 for surface waters are given in Tables 3-3 and 3-4.

The Regional Board intends to work towards the derivation of site-specific objectives for the Bay-Delta estuarine system. Site-specific objectives to be considered by the Regional Board shall be developed in accordance with the provisions of the federal Clean Water Act, the State Water Code, State Board water quality control plans, and this Plan. These site-specific objectives will take into consideration factors such as all available scientific information and monitoring data and the latest U.S. EPA guidance, and local environmental conditions and impacts caused by bioaccumulation. Copper, mercury, PCBs, and selenium will be the highest priorities in this effort. Pending the adoption of site-specific objectives, the objectives in Tables 3-3 and 3-4 apply throughout the region.

Based on the concerns raised in the Regional Monitoring Program, pilot fish contamination study, cooperative striped bass study, and other studies, water quality objectives for aromatic hydrocarbons are also needed.

The South Bay below the Dumbarton Bridge is a unique, water-quality-limited, hydrodynamic and biological environment that merits continued special attention by the Regional Board. Site-specific water quality objectives are absolutely necessary in this area for two reasons. First, its unique hydrodynamic environment dramatically affects the environmental fate of pollutants. Second, potentially costly nonpoint source pollution control measures must be implemented to attain any objectives for this area. The costs of those measures must be factored into economic impact considerations by the Regional Board in adopting any objectives for this area. Nowhere else in the region will nonpoint source economic considerations have such an impact on the attainability of objectives. Therefore, for this area, the objectives contained in Tables 3-3 and 3-4 will be considered guidance only, and should be used as part of the basis for site-specific objectives. Programs described in Chapter 4 will be used to develop site-specific objectives. Ambient conditions shall be maintained until site-specific objectives are developed.

CONSTITUENTS OF CONCERN FOR MUNICIPAL AND AGRICULTURAL WATER SUPPLIES

At a minimum, surface waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of constituents in excess of the maximum (MCLs) or secondary maximum contaminant levels (SMCLs) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Table 64449-A (SMCLs-Consumer Acceptance Limits) and 64449-B (SMCLs-Ranges) of Section 64449. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. Table 3-5 contains water quality objectives for municipal supply, including the MCLs contained in various sections of Title 22 as of the adoption of this plan.

At a minimum, surface waters designated for use as agricultural supply (AGR) shall not contain concentrations of constituents in excess of the levels specified in Table 3-6.

RADIOACTIVITY

Radionuclides shall not be present in concentrations that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life. Waters designated for use as domestic or municipal supply shall not contain concentrations of radionuclides in excess of the limits specified in Table 4 of Section 64443 (Radioactivity) of Title 22 of the California Code of Regulations, which is incorporated by reference into this Plan. This incorporation is prospective, including future changes to the incorporated provisions as the changes take effect (see Table 3-5).

OBJECTIVES FOR GROUNDWATERS

Groundwater objectives consist primarily of narrative objectives combined with a limited number of numerical objectives. Additionally, the Regional Board will establish basin-

and/or site-specific numerical groundwater objectives as necessary. For example, the Regional Board has groundwater basin-specific objectives for the Alameda Creek watershed above Niles to include the Livermore-Amador Valley as shown in Table 3-7.

The maintenance of existing high quality of groundwater (i.e., "background") is the primary groundwater objective.

In addition, at a minimum, groundwaters shall not contain concentrations of bacteria, chemical constituents, radioactivity, or substances producing taste and odor in excess of the objectives described below unless naturally occurring background concentrations are greater.

BACTERIA

In groundwaters with a beneficial use of municipal and domestic supply, the median of the most probable number of coliform organisms over any seven-day period shall be less than 1.1 MPN/100 mL (based on multiple tube fermentation technique; equivalent test results based on other analytical techniques as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21 (f), revised June 10, 1992, are acceptable).

ORGANIC AND INORGANIC CHEMICAL CONSTITUENTS

All groundwaters shall be maintained free of organic and inorganic chemical constituents in concentrations that adversely affect beneficial uses. To evaluate compliance with water quality objectives, the Regional Board will consider all relevant and scientifically valid evidence, including relevant and scientifically valid numerical criteria and guidelines developed and/or published by other agencies and organizations (e.g.,U.S. EPA, the State Water Resources Control Board, California Department of Health Services, U.S. Food and Drug Administration, National Academy of Sciences, Cal/EPA Office of Environmental Health Hazard Assessment, U.S. Agency for Toxic Substances and Disease Registry, Cal/EPA Department of Toxic Substances Control, and other appropriate organizations.)

At a minimum, groundwaters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of constituents in excess of the maximum (MCLs) or secondary maximum contaminant levels (SMCLs) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, and Table 64444-A (Organic Chemicals) of Section 64444. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

Groundwaters with a beneficial use of agricultural supply shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use. In determining compliance with this objective, the Regional Board will consider as evidence relevant and scientifically valid water quality goals from sources such as the Food and Agricultural Organizations of the United Nations; University of California Cooperative Extension, Committee of Experts; and McKee and Wolf's "Water Quality Criteria," as well as other relevant and scientifically valid evidence. At a minimum, groundwaters designated for use as agricultural supply (AGR) shall not contain concentrations of constituents in excess of the levels specified in Table 3-6.

Groundwaters with a beneficial use of freshwater replenishment shall not contain concentrations of chemicals in amounts that will adversely affect the beneficial use of the receiving surface water.

Groundwaters with a beneficial use of industrial service supply or industrial process supply shall not contain pollutant levels that impair current or potential industrial uses.

To assist dischargers and other interested parties, the Central Valley Regional Board's staff has compiled many numerical water quality criteria from other appropriate agencies and organizations in its staff report, "A Compilation of Water Quality Goals." This staff report is updated regularly to reflect changes in these numerical criteria.

RADIOACTIVITY

At a minimum, groundwaters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the maximum contaminant levels (MCLs) specified in Table 4 (Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations, which is incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

TASTE AND ODOR

Groundwaters designated for use as domestic or municipal supply (MUN) shall not contain taste- or odor-producing substances in concentrations that cause a nuisance or adversely affect beneficial uses. At a minimum, groundwaters designated for use as domestic or municipal supply shall not contain concentrations in excess of the secondary maximum contaminant levels (Secondary MCLs) specified in Tables 64449-A (Secondary MCLs-Consumer Acceptance Limits) and 64449-B (Secondary MCLs-Ranges) of Section 64449 of Title 22 of the California Code of Regulations, which is incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

OBJECTIVES FOR THE DELTA AND SUISUN MARSH

The objectives contained in the State Board's "Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh" and any revisions thereto shall apply to the waters of the Sacramento-San Joaquin Delta and Suisun Marsh.

OBJECTIVES FOR ALAMEDA CREEK WATERSHED

The water quality objectives contained in Table 3-7 apply to the surface and groundwaters of the Alameda Creek watershed above Niles.

Wastewater discharges that cause the surface water limits in Table 3-7 to be exceeded may be allowed if they are part of an overall waterwastewater resource operational program developed by those agencies affected and approved by the Regional Board.

TABLE 3-1 WATER QUALITY OBJECTIVES FOR COLIFORM BACTERIA [a]

BENEFICIAL USE	FECAL COLIFORM (MPN /100ML)	TOTAL COLIFORM (MPN/100ML)
Water Contact Recreation	log mean < 200 90th percentile < 400	median < 240 no sample > 10,000
Shellfish Harvesting[b]	median < 14 90th percentile < 43	median < 70 90th percentile < 230[c]
Non-contact Water Recreation[d]	mean < 2000 90th percentile < 4000	
Municipal Supply: - Surface Water[e] - Groundwater	log mean < 20	log mean < 100 < 1.1[f]

NOTES:
a. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
b. Source: National Shellfish Sanitation Program.
c. Based on a five-tube decimal dilution test or 300 MPN/100 ml when a three-tube decimal dilution test is used.
d. Source: Report of the Committee on Water Quality Criteria, National Technical Advisory Committee, 1968.
e. Source: DOHS recommendation.
f. Based on multiple tube fermentation technique; equivalent test results based on other analytical techniques, as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21(f), revised June 10, 1992, are acceptable.

TABLE 3-2 U.S. EPA BACTERIOLOGICAL CRITERIA FOR WATER CONTACT RECREATION[1,2] (IN COLONIES PER 100 ML)

	FRESH WATER		SALT WATER
	ENTEROCOCCI	E. COLI	ENTEROCOCCI
Steady State (all areas)	33	126	35
Maximum at:			
- designated beach	61	235	104
- moderately used area	89	298	124
- lightly used area	108	406	276
- infrequently used area	151	576	500

NOTES:
1. The criteria were published in the Federal Register, Vol. 51, No. 45 / Friday, March 7, 1986 / 8012 - 8016. The Criteria are based on:
(a) Cabelli, V.J. 1983. Health Effects Criteria for Marine Recreational Waters. U.S. EPA, EPA 600/1-80-031, Cincinnati, Ohio, and
(b) Dufour, A.P. 1984. Health Effects Criteria for Fresh Recreational Waters. U.S. EPA, EPA 600/1-84-004, Cincinnati, Ohio.
2. The U.S. EPA criteria apply to water contact recreation only. The criteria provide for a level of protection based on the frequency of usage of a given water contact recreation area. The criteria may be employed in special studies within this region to differentiate between pollution sources or to supplement the current coliform objectives for water contact recreation.

TABLE 3-3 WATER QUALITY OBJECTIVES FOR TOXIC POLLUTANTS FOR SURFACE WATERS WITH SALINITIES GREATER THAN 5 PPT [a,b]

(ALL VALUES IN UG/L)

COMPOUND	4-DAY AVERAGE [c]	1-HR AVERAGE [c]	24-HR AVERAGED	INSTANTANEOUS MAXIMUM [d]
Arsenic	36.0	69.0		
Cadmium	9.3	43.0		
Chromium (VI)[e]	50.0	1100.0		
Copper		[f]		
Cyanide		5.0		
Lead	5.6	140.0		
Mercury	0.025	2.1		
Nickel[g]			7.1	140.0
Selenium				
Silver				2.3
Tributyltin[h]				
Zinc			58.0	170.0
PAHs[i]			15.0	

NOTES:

a. These objectives shall apply to all estuarine waters within the region, according to the salinity threshold, except for the South Bay below Dumbarton Bridge.

b. The values reported in this table are derived from the 1980 and 1984 U.S. EPA Ambient Water Quality Criteria for salt water and fresh water (unless otherwise specified) and were adopted by the Board in 1986. In 1992, the Regional Board adopted a more inclusive set of objectives reflecting more recent technical information; this set of objectives had been developed and adopted as part of the statewide Inland Surface Waters and Enclosed Bays and Estuaries Plan and was ruled invalid by a court decision in 1993. The U.S. EPA is expected to promulgate final water quality standards for California in late 1995. The national standards will then apply to all planning, monitoring, NPDES permitting, enforcement, and compliance programs conducted under the Clean Water Act within the state.

c. Source: U.S. EPA 1984.

d. Source: U.S. EPA 1980.

e. This objective may be met as total chromium.

f. The current U.S. EPA criterion is 2.9 ug/l. However, copper toxicity varies with the complexing capacity of specific receiving waters, and background concentrations in the Bay typically vary from 1 to 4 ug/l. The Regional Board conducted scientific studies on Bay waters between 1986 and 1992 and determined that 4.9 ug/l was a more appropriate value for a site-specific objective, given U.S. EPA's derivation method. U.S. EPA is reviewing that method as part of its national rulemaking for California water quality standards. A site-specific criterion for copper is urgently needed.

g. The current U.S. EPA criterion is 8.3 ug/l (4-day average).

h. Tributyltin is a compound used as an antifouling ingredient in marine paints and toxic to aquatic life in low concentrations (<1 ppb). Based on technical information, a value of 0.005 ug/l (30-day average) would be protective of human health.

i. U.S. EPA water quality criteria indicate that 0.031 ug/l in both fresh water and salt water is protective of human health, based on setting the acceptable lifetime risk for cancer at the 10-6 risk level. PAHs are those compounds identified by EPA Method 610.

TABLE 3-4 WATER QUALITY OBJECTIVES FOR TOXIC POLLUTANTS FOR SURFACE WATERS WITH SALINITIES LESS THAN 5 PPT[a,b]

(ALL VALUES IN UG/L)

COMPOUND	4-DAY AVERAGE [c]	1-HR AVERAGE [c]	24-HR AVERAGE [d]	INSTANTANEOUS MAXIMUM [d]
Arsenic	190.0	360.0		
Cadmium	e	e		
Chromium (VI)[f]	11.0	16.0		
Copper[g]	6.5	9.2		
Cyanide	5.2	22.0		
Lead	h	h		
Mercury	0.025[i]	2.4		
Nickel	j	j	56.0	1100.0
Selenium				
Silver[k]				1.2
Tributyltin[l]				
Zinc	m	m	58.0	170.0
PAHs[n]				

NOTES:

a. These objectives shall apply to all estuarine and inland surface waters within the region where the salinity is less than 5 ppt, except for the South Bay below Dumbarton Bridge.

b. The values reported in this table are derived from the 1980 and 1984 U.S. EPA Ambient Water Quality Criteria for salt water and fresh water (unless otherwise specified) and were adopted by the Regional Board in 1986. In 1992, the Regional Board adopted a more inclusive set of objectives reflecting more recent technical information; this set of objectives had been developed and adopted as part of the statewide Inland Surface Waters and Enclosed Bays and Estuaries Plan and was ruled invalid by a court decision in 1993. The U.S. EPA is expected to promulgate final water quality standards for the California in late 1995. The national standards will then apply to all planning, monitoring, NPDES permitting, enforcement, and compliance programs conducted under the Clean Water Act within the state.

c. Source: U.S. EPA 1984.

d. Source: U.S. EPA 1980.

e. The objectives for cadmium and other noted metals are expressed by formulas where H = ln (hardness) as $CaCO_3$ in mg/l: The four-day average objective for cadimium is $e^{(0.7852\,H\,-\,3.490)}$. This is 1.1 µg/l at a hardness of 100 mg/l as $CaCO_3$. The one-hour average objective for cadimium is $e^{(1.128\,H\,-\,3.828)}$. This is 3.9 µg/l at a hardness of 100 mg/l as $CaCO_3$.

f. This limit may be met as total chromium.

g. The U.S. EPA water quality criteria for copper are hardness-dependent. The current objectives are equivalent to these criteria as calculated for 50 mg/l hardness as $CaCO_3$. The four-day average EPA criterion for copper is $e^{(0.8545H\,-1.465)}$; the one-hour average criterion is $e^{(0.9422H-1.464)}$.

h. The four-day average objective for lead is $e^{(1.273H-4.705)}$. This is 3.2 µg/l at at hardness of 100 mg/l as $CaCO_3$. The one-hour average objective for lead is $e^{(1.273H-1.460)}$. This is 81 µg/l at a hardness of 100 mg/l as $CaCO_3$.

i. The U.S. EPA Water Quality Criterion for mercury is 0.012 µg/l, which is below the level of detection of 0.025 µg/l. An objective of 0.012 µg/l is desirable, but attainment can only be determined at the level of detection.

j. The U.S. EPA criteria for nickel are hardness-dependent; the 4-day average criterion is $e^{(0.846\,H+1.1645)}$, which is 158 µg/l at a hardness of 100 mg/l as $CaCO_3$. The 1-hour average is $e^{(0.846H+3.3612)}$, which is 1,419 µg/l at a hardness of 100 mg/l as $CaCO_3$.

k. The U.S. EPA water quality criterion for silver is hardness-dependent. This objective is equivalent to these criteria as calculated for 50 mg/l hardness as $CaCO_3$. The instantaneous maximum EPA criterion is $e^{(1.72H-6.52)}$.

l. Tributyltin is a compound used as an antifouling ingredient in marine paints and toxic to aquatic life in low concentrations (<1 ppb). Based on technical information, values of 0.02 µg/l (4-day average), 0.04 µg/l (24-hour average), and 0.06 µg/l (instantaneous maximum) would be protective of aquatic life.

m. The U.S. EPA criteria for zinc are hardness-dependent: the 4-day average criterion is $e^{(0.8473H-0.7614)}$, which is 23 µg/l at a hardness of 100 mg/l as $CaCO_3$. The 1-hour average is $e^{(0.8473H-0.8604)}$, which is 21 µg/l at a hardness of 100 mg/l as $CaCO_3$.

n. U.S. EPA water quality criteria indicate that 0.031 µg/l in both fresh water and salt water is protective of human health, based on setting the acceptable lifetime risk for cancer at the 10^{-6} risk level. PAHs are those compounds identified by EPA Method 610.

TABLE 3-5 WATER QUALITY OBJECTIVES FOR MUNICIPAL SUPPLY

PARAMETER	OBJECTIVE (IN MG/L)
Physical:	
Color (units)[a]	15.0
Odor (number)[a]	3.0
Turbidity (NTU)[a]	5.0
pH[b]	6.5
TDS[c]	500.0
EC (mmhos/cm)[c]	0.9
Corrosivity	non-corrosive
Inorganic Parameters:	
Aluminum[d]	1.0[d] /0.2[a]
Antimony[d]	0.006
Arsenic[d]	0.05
Asbestos[d]	7 MFL[e]
Barium[d]	1.0
Beryllium[d]	0.004
Chloride[c]	250.0
Cadmium[d]	0.005
Chromium[d]	0.05
Copper[a]	1.0
Cyanide[d]	0.2
Fluoride[f]	0.8-1.7[g]
Iron[a]	0.3
Lead[b]	0.05
Manganese[a]	0.05
Mercury[d]	0.002
Nickel[d]	0.1
Nitrate (as NO_3)[d]	45.0
Nitrate + Nitrite (as N)[d]	10.0
Nitrite (as N)[d]	1.0
Selenium[d]	0.05
Silver[b]	0.05
Sulfate[c]	250.0
Thallium[d]	0.002
Zinc[a]	5.0
Organic Parameters:	
MBAS (Foaming agents)[a]	0.5
Oil and grease[b]	none
Phenols[b]	0.001
Trihalomethanes[b]	0.1
Chlorinated Hydrocarbons:	
Endrin[h]	0.002
Lindane[h]	0.0002
Methoxychlor[h]	0.04
Toxaphene[h]	0.003
2,3,7,8-TCDD (Dioxin)[h]	3×10^{-8}
2,4-D[h]	0.07
2,4,4-TP Silvex[h]	0.05
Synthetics:	
Alachlor[h]	0.002
Atrazine[h]	0.003
Bentazon[h]	0.018
Benzo(a)pyrene[h]	0.0002
Dalapon[h]	0.2
Dinoseb[h]	0.007
Diquat[h]	0.02
Endothall[h]	0.1

PARAMETER	OBJECTIVE (IN MG/L)
Benzene[h]	0.001
Carbon Tetrachloride[h]	0.0005
Carbofuran[h]	0.018
Chlordane[h]	0.0001
1,2-Dibromo-3 -chloropropane[h]	0.0002
1,2-Dichlorobenzene[h]	0.6
1,4-Dichlorobenzene[h]	0.005
1,1-Dichloroethane[h]	0.005
1,2-Dichloroethane[h]	0.0005
cis-1,2-Dichloroethlyene[h]	0.006
trans-1,2-Dichloroethylene[h]	0.01
1,1-Dichloroethylene[h]	0.006
Dichloromethane[h]	0.005
1,2-Dichloropropane[h]	0.005
1,3-Dichloropropene[h]	0.0005
Di (2-ethylhexyl) adipate[h]	0.4
Di(2-ethylhexyl) phthalate[h]	0.004
Ethylbenzene[h]	0.7
Ethylene dibromide[h]	0.00005
Glyphosate[h]	0.7
Heptachlor[h]	0.00001
Heptachlor epoxide[h]	0.00001
Hexachlorobenzene[h]	0.001
Hexachlorocyclopentadiene[h]	0.05
Molinate[h]	0.02
Monochlorobenzene[h]	0.07
Oxamyl[h]	0.2
Pentachlorophenol[h]	0.001
Picloram[h]	0.5
Polychlorinated Biphenyls[h]	0.0005
Simazine[h]	0.004
Styrene[h]	0.1
1,1,2,2-Tetrachloroethane[h]	0.001
Tetrachloroethylene[h]	0.005
Thiobencarb[h]	0.001
1,2,4-Trichlorobenzene[h]	0.07
1,1,1-Trichloroethane[h]	0.2
1,1,2-Trichloroethane[h]	0.005
Trichloroethylene[h]	0.005
Trichlorofluoromethane[h]	0.15
1,1,2-Trichloro-1,2,2-trifluoroethane[h]	1.2
Toluene[h]	0.15
Vinyl chloride[h]	0.0005
Xylenes (single or sum of isomers)[h]	1.75

PARAMETER	OBJECTIVE (IN pCi/l)
Radioactivity:	
Combined Radium-226 and Radium-228[i]	5
Gross Alpha Particle Activity[i]	15[j]
Tritium[i]	20,000
Strontium-90[i]	8
Gross Beta Particle Activity[i]	50
Uranium[i]	20

NOTES:

a. Secondary Maximum Contaminant Levels as specified in Table 64449-A of Section 64449, Title 22 of the California Code of Regulations, as of June 19, 1995.

b. Table III-2, 1986 Basin Plan.

c. Secondary Maximum Contaminant Levels as specified in Table 64449-B of Section 64449, Title 22 of the California Code of Regulations, as of June 19, 1995. (Levels indicated are "recommended" levels. Table 64449-B contains a complete list of upper and short-term ranges.)

d. Maximum Contaminant Levels as specified in Table 64431-A (Inorganic Chemicals) of Section 64431, Title 22 of the California Code of Regulations, as of June 19, 1995.

e. MFL = million fibers per liter; MCL for fibers exceeding 10 µm in length.

f. Flouride objectives depend on temperature.

g. A complete list of optimum and limiting concentrations is specified in Table 64431-B of Section 64431, Title 22 of the California Code of Regulations, as of June 19, 1995.

h. Maximum Contaminant Levels as specified in Table 64444-A (Organic Chemicals) of Section 64444, Title 22 of the California Code of Regulations, as of June 19, 1995.

i. Maximum Contaminant Levels as specified in Table 4 (Radioactivity) of Section 64443, Title 22 of the California Code of Regulations, as of December 22, 1988.

j. Includes Radium-226 but excludes Radon and Uranium.

TABLE 3-6 WATER QUALITY OBJECTIVES FOR AGRICULTURAL SUPPLY [a]

(IN MG/L)

PARAMETER	THRESHOLD	LIMIT	LIMIT FOR LIVESTOCK WATERING
Physical:			
pH	5.5-8.3	4.5-9.0	
TDS			10,000.0
EC (mmhos/cm)		0.2-3.0	
Inorganic Parameters:			
Aluminum	5.0	20.0	5.0
Arsenic	0.1	2.0	0.2
Beryllium	0.1	0.5	
Boron	0.5	2.0	5.0
Chloride	142.0	355.0	
Cadmium	0.01	0.5	0.05
Chromium	0.1	1.0	1.0
Cobalt	0.05	5.0	1.0
Copper	0.2	5.0	0.5
Fluoride	1.0	15.0	2.0
Iron	5.0	20.0	
Lead	5.0	10.0	0.1
Lithium		2.5[b]	
Manganese	0.2	10.0	
Molybdenum	0.01	0.05	0.5
Nickel	0.2	2.0	
$NO_3 + NO_2$ (as N)	5.0	30[c]	100.0
Selenium		0.02	0.05
Sodium adsorption ratio (adjusted)[d]	3.0	9.0	
Vanadium	0.1	1.0	0.1
Zinc	2.0	10.0	25

NOTES:

a. For an extensive discussion of water quality for agricultural puposes, see "A Compilation of Water Quality Goals," Central Valley Regional Water Quality Control Board, May 1993.

b. For citrus irrigation, maximum 0.075 mg/l.

c. For sensitive crops. Values are actually for NO_3-N + NH_4-N.

d. Adjusted SAR = [Na / (Ca+Mg) 1/2][1+(8.4-pHc)] where pHc is a calculated value based on total cations, 2 Ca + Mg+ CO_3 + HCO_3, in me/l. Exact calcuations of pHc can be found in "Guidelines for Interpretation of Water Quality for Agriculture" prepared by the Univ. of California Cooperative Extension.

TABLE 3-7 WATER QUALITY OBJECTIVES FOR THE ALAMEDA CREEK WATERSHED ABOVE NILES

SURFACE WATER QUALITY OBJECTIVES (ALAMEDA CREEK AND TRIBUTARIES)

TDS:	250 mg/l (90 day-arithmetic mean)
	360 mg/l (90 day-90th percentile)
	500 mg/l (daily maximum)
Chlorides:	60 mg/l (90 day-arithmetic mean)
	100 mg/l (90 day-90th percentile)
	250 mg/l (daily maximum)

GROUNDWATER QUALITY OBJECTIVES

(Concentration not to be exceeded more than 10 percent of the time during one year.)

Central Basin

TDS:	Ambient or 500 mg/l, whichever is lower
Nitrate (NO_3):	45 mg/l

Fringe Subbasins

TDS:	Ambient or 1000 mg/l, whichever is lower
Nitrate (NO_3):	45 mg/l

Upland and Highland Areas

California domestic water quality standards set forth in California Code of Regulations, Title 22, and current county standards.

Ambient water quality conditions at a proposed project area will be determined by Zone 7 of the Alameda County Flood Control and Water Conservation District at the time the project is proposed, with the cost borne by the project proponents. Ambient conditions apply to the water-bearing zone with the highest quality water.

Waters designated for use as domestic or municipal water supply shall not contain concentrations of chemicals in excess of natural concentrations or the limits specified in California Code of Regulations, Title 22, Chapter 15, particularly Tables 64431-A and 64431-B of Section 64431, Table 64444-A of Sectiion 64444, and Table 4 of Section 64443.

4 IMPLEMENTATION PLAN

INTRODUCTION

The San Francisco Bay Regional Water Quality Control Board's overall mission is to protect the beneficial uses supported by the quality of the San Francisco Bay Basin's surface and ground waters. Together, the beneficial uses described in detail in Chapter 2 define the resources, services, and qualities of aquatic ecosystems that are the ultimate goals of protecting and achieving water quality. The objectives presented in Chapter 3 present a framework for determining whether water quality is indeed supporting these beneficial uses. This chapter describes in detail the Regional Board's programs and specific plans of action for meeting those objectives.

The descriptions of specific actions to be taken by local public entities and industries to comply with the policies and objectives of this Water Quality Control Plan (Plan) are intended for the guidance of local officials. The Regional Board will consider any proposed alternative actions that are consistent with and achieve the policies and objectives of the Plan.

This chapter first describes the watershed management conceptual framework for water quality control in the region. Next, it presents each of the individual programs that form part of this comprehensive approach. These programs are organized into five categories: (1) surface water protection and management–point source control, (2) surface water protection and management–nonpoint source control, (3) groundwater protection and management, (4) emerging program areas, and (5) continuing planning. Taken together, these programs constitute an integrated, comprehensive water quality control program that is protective, efficient, and flexible.

THE WATERSHED-MANAGEMENT APPROACH

The watershed approach consists of programs aimed at three different levels:

1) The larger San Francisco Bay Estuary,
2) Smaller segments within the Estuary, and
3) Individual watersheds draining into the larger system.

A major part of the Regional Board's water quality control program focuses on managing the influx of toxic pollutants to the larger San Francisco Bay Estuary aquatic system. The overall goal of these programs is to limit the total amount of pollutants in the entire system to ensure protection of beneficial uses.

Regardless of whether the focus is on the whole system or on a single creek, watershed management involves ongoing research, investigation, and monitoring, along with control measures or changes in practice. The next three sections present the conceptual framework around which the Regional Board's water quality programs are structured.

QUICK INDEX PAGE

C—107524

C-107524

TOXIC POLLUTANT MANAGEMENT IN THE LARGER SAN FRANCISCO BAY ESTUARY SYSTEM

INTRODUCTION

The Regional Board's water quality program began nearly three decades ago with a focus on controlling the discharge of point sources of pollution, such as municipal sewage and industrial wastewater. Since then, highly effective waste treatment systems have been built, essentially eliminating what had been major water quality problems associated with high nutrient and organic loading. In addition, the overall influx of toxic pollutants from point sources has significantly declined as a result of these efforts. Still, certain toxic pollutants remain a great concern.

The focus of efforts to attain water quality goals has shifted accordingly. Further reductions in point source pollutant loadings are being attained through complex, innovative programs often involving numerous public agencies and private organizations. Loading from nonpoint sources, such as urban and agricultural runoff, had until recently continued largely unchecked. These nonpoint sources are now generally considered to be the largest source of pollutants to aquatic systems. New Regional Board programs aim to reduce this diffuse pollutant loading.

NUMERICAL WATER QUALITY OBJECTIVES: WASTELOAD ALLOCATIONS

The numerical objectives presented in Chapter 3 define maximum levels of individual pollutants allowed in the waters of the region. These objectives are based on extensive technical information that relates concentrations of pollutants in water to adverse effects on beneficial uses.

Assuring that pollutant concentrations throughout the whole Estuary system will meet objectives for each pollutant requires (a) information on the fate, transport, and distribution of that pollutant; and (b) quantification of loading from all sources, including riverine inputs, urban and agricultural runoff, and point source discharges. When this information is available, the total amount of each pollutant that can enter the system without exceeding water quality objectives can be calculated. The maximum pollutant load can then be allocated among all sources, a process known as wasteload allocation. By considering pollutant influx from all sources, wasteload allocation supports the identification and implementation of the most effective and economically efficient means of achieving water quality objectives in the larger Estuary system.

There are three limitations to this approach. First, there are many pollutants of local concern for which objectives have not been developed and adopted. The objectives for specific toxic pollutants contained in Chapter 3 are reasonable for the purposes of interim regulation because they provide a minimum level of protection in the Estuary; however, additional objectives are necessary to fully implement the wasteload allocation approach. The Regional Board will establish water quality objectives for selected pollutants as the necessary technical information becomes available and a framework for assessing economic factors is developed.

Second, the wasteload allocation approach only considers the impact of individual pollutants. Aquatic systems in the region contain mixtures of pollutants in a complex and variable water matrix. Implementation of the toxicity objective described in the following section addresses this issue.

Finally, substances that accumulate in sediment or organisms pose a more complicated problem for water quality control. The additional considerations necessary for these pollutants are described below.

TOXIC POLLUTANT ACCUMULATION: MASS-BASED STRATEGIES

Wasteload allocations based on the achievement of numerical water quality objectives will provide appropriate protection of beneficial uses for many toxic pollutants. For some pollutants, however, concentrations in water are not good indicators of their impairment of beneficial uses. Instead, wasteload allocations for such compounds are developed based on mass, rather than concentration, and tissue and sediment concentrations. Typically, mass-based allocations require more extensive technical information on the fate and transport of pollutants in the system than those based on water alone.

The Regional Board implements the narrative objectives regarding sediment accumulation and bioaccumulation in several ways. These are discussed in greater detail later in this chapter. In general, pollutants are identified and monitored in both discharges and the aquatic system. At a minimum, limits placed on point and nonpoint discharges take pollutant accumulation into consideration. Ultimately, the goal is to develop system-wide, mass-based wasteload allocations for appropriate substances.

SCIENTIFIC RESEARCH: ONGOING REFINEMENT OF PROGRAMS

The quantity of pollutants in the Estuary system is the result of many complex and interacting factors beyond the total amount discharged day-to-day. Levels of pollutants in water, sediments, and aquatic organisms are regularly assessed through the Regional Monitoring Program and other surveillance described in Chapter 6.

In addition, implementation of this Water Quality Control Plan involves research and investigation on processes controlling the fate, transport, and distribution of pollutants. In the past, the Regional Board has supported research on Delta outflow and associated flushing, sediment movement, chemical transformations within the aquatic system, and biological effects associated with existing and projected pollutant levels.

Information resulting from ongoing scientific research and regular monitoring within the Estuary is continuously incorporated into each of the programs described in detail later in this chapter. In addition, the Regional Board typically requires technical investigations in situations where water quality problems have been identified, but not enough information is available to craft appropriate courses of action. As a result, programs are constantly evolving as better scientific information becomes available.

RIVERINE FLOWS, SYSTEM FLUSHING, AND POLLUTANT LOADING

DELTA OUTFLOW

In addition to pollution control measures, achieving water quality objectives and protecting the beneficial uses of the San Francisco Bay Estuary system (particularly fish migration and estuarine habitat) depends on freshwater outflow from the Delta. Adequate freshwater inflow to the Bay system is necessary to control salinity, to provide mixing (particularly in the entrapment zone), to maintain proper temperature, and to flush out residual pollutants that cannot be eliminated by treatment or nonpoint source management. Except for local drainage and wastewater discharges, Delta outflow provides virtually all the freshwater inflow to San Francisco Bay. However, the availability of adequate Delta outflow to meet these needs is very uncertain because of the existing and potential upstream diversions of water and fluctuations in rainfall.

The State Board first addressed the issue of the Bay's inflow needs in the Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh in the Water Rights Decision 1485, issued in August, 1978. In these documents, the State Board established maximum salinity standards (but no corresponding flow standards for the Delta) and required the two major water diverters to conduct research and determine:

- Outflow needs in San Francisco Bay, including the ecological benefits of unregulated outflows and salinity gradients established by them; and
- The need for winter flows for long-term protection of striped bass and other aquatic organisms in the Delta.

In 1993, estuarine scientists and managers associated with the San Francisco Estuary Project recommended development of salinity standards for different parts of the year to be used in conjunction with flow standards. Specifically, they indicate that average upstream positions of the near-bottom 2‰ isohaline would be an appropriate index for salinity standards.

Technical evidence developed during the Estuary Project process and the State Board Bay/Delta hearings will be used to help formulate future amendments to the Basin Plan.

SAN LUIS DRAIN

The San Luis Drain is a proposed method of funneling agricultural runoff from the San Joaquin Valley into the Delta.

Agricultural irrigation in the San Joaquin Valley leads to high salinity concentrations in the soil, which may be harmful to crops. To alleviate this condition, tile drains have been and are being installed to carry the saline water away from the fields. However, there have been adverse environmental effects associated with this wastewater.

In 1982, the U.S. Fish and Wildlife Service discovered selenium concentrations in fish from the San Luis Drain and Kesterson Reservoir to be as much as 100 times higher than background. It also found high mortalities and deformities among newborn coots, grebes, stilts, and ducks.

There was early concern about the potential for impacts on beneficial uses in the Estuary if the Drain were completed and discharged into the Delta. In response, the Regional Board prohibited the proposed discharge in 1964, unless compelling evidence that the proposed discharge would not harm beneficial uses was submitted by proponents. In 1981, the Regional Board requested that the State Board take the lead role in developing, revis-

ing, renewing, and enforcing waste discharge requirements for the Drain.

Unfortunately, the problem of agricultural drainage still exists. The San Joaquin Valley Drainage Program, another state and federal interagency program, has begun to investigate further the problems associated with the drainage of agricultural lands and to develop solutions.

TOXIC POLLUTANT MANAGEMENT IN SEGMENTS OF THE SAN FRANCISCO BAY ESTUARY

LOCAL WASTELOAD ALLOCATION

Protection of aquatic systems in the immediate vicinity of identified discharges is the second component of water quality control in the larger Estuary system. This approach is based on attaining objectives near discharges, and thereby providing a reasonable level of protection for the whole system.

Because of the high degree of uncertainty regarding pollutant fate and transport in the larger Estuary system, local wasteload allocation drives many of the Regional Board's current programs. This chapter's sections on point source control describe how this approach is implemented for effluents.

EFFLUENT TOXICITY CONTROL PROGRAM: LOCAL TOXICITY OBJECTIVES

The water quality objective for toxicity (see Chapter 3) is designed to protect beneficial uses against mixtures of pollutants typically found in aquatic systems. Toxicity is used because numerical objectives for individual pollutants do not take mixtures into account. The Regional Board implements this objective through its Effluent Toxicity Control Program and by monitoring the toxicity of waters at or near discharge sites.

The long-term goal of the Effluent Toxicity Control Program (ETCP) is to develop water quality-based effluent limits using information about the acute and chronic toxicity of each discharge and resulting toxicity in the receiving water. The toxicity approach is identical to meeting numerical water quality objectives near discharges, except that it includes the development of sophisticated toxicity objectives that are specific both to the Bay and characteristics of local discharges.

LOCAL TOXIC POLLUTANT ACCUMULATION

Some of the pollutants contained in nonpoint and point source discharge accumulate in sediment and/or the tissue of aquatic organisms. In many cases, programs based on numerical objectives for individual pollutants and toxicity objectives do not fully consider the accumulation of these pollutants.

To address pollutant accumulation, the Regional Board has initiated a program requiring major dischargers to monitor sediment and bioaccumulation near discharge sites. Information from such local-effects monitoring is then assessed in conjunction with data collected by the Regional Monitoring Program (Chapter 6) and other research.

The goal of local-effects monitoring is to assure that the narrative objectives regarding pollutant accumulation in sediments and aquatic organisms are met in each segment of the Estuary.

TOXIC POLLUTANT MANAGEMENT IN INDIVIDUAL WATERSHEDS

Protection of beneficial uses associated with the larger San Francisco Bay Estuary also depends upon achieving water quality goals within each of the watersheds draining to the Bay. Successful wasteload allocations depend upon limiting pollutant influx from nonpoint as well as point sources. In turn, nonpoint source control is dependent on a wide range of factors, including physical factors, such as the geology and hydrological characteristics of an area; existing natural resources, such as vegetation along streambanks; and a wide range of human activities.

Watershed management planning in each individual watershed involves a series of steps. First, a detailed assessment of current conditions, including identification of existing or potential problems, is conducted. Next, the process attempts to bring together all affected stakeholders and interested parties to determine how they would manage their watershed. Finally, specific actions are taken during implementation of the local plan.

The Regional Board firmly believes that watershed planning and protection efforts will not be effective unless solutions are defined and implemented at a local level. The following sections present two examples of local watershed management planning activities supported by the Regional Board.

THE NAPA EXAMPLE

The Regional Board has initiated county-level watershed management planning efforts. The first began in Napa County where depressed oxygen levels, high coliform levels, and sedimentation due to erosion were recurring problems in segments of the Napa River.

The Regional Board initiated the planning process by preparing a complete resource evaluation in cooperation with a wide range of local public and private entities. This evaluation encompassed traditional evaluations of natural resources and also included descriptions of existing management and regulatory frameworks, funding, and tax incentive programs to support the local planning process.

The Regional Board is supporting local agency staff, public officials, agricultural landowners, urban residents of Napa County, and the Napa Resource Conservation District in their efforts to define watershed management goals and specific actions that will eventually allow those goals to be met. The Regional Board will support other county-level watershed management planning in a similar manner.

THE CORTE MADERA CREEK EXAMPLE

In 1994, the Regional Board completed a field survey of fisheries, macroinvertebrates, riparian habitat, erosion, land use, point and nonpoint discharges, and water quality in Marin County's Corte Madera Creek watershed. Combining the field data with existing information on community use of the creek, the Regional Board published a report outlining potential water quality problems and opportunities for enhancement.

Citizens, local agency staff, and public officials are using this information to help determine watershed management goals, such as enhancement of the steelhead trout population, and specific actions, such as eliminating discharge of swimming pool water to the creek.

The Regional Board is providing continuing support to local residents engaged in this planning process.

DISCHARGE PROHIBITIONS APPLICABLE THROUGHOUT THE REGION

To protect water quality of all aquatic systems throughout the region, the discharge prohibitions listed in Table 4-1 apply. The Regional Board will not allow exceptions to these prohibitions, except where noted below.

Exceptions to Prohibitions 1, 2, and 3 will be considered where:

- An inordinate burden would be placed on the discharger relative to beneficial uses protected, and an equivalent level of environmental protection can be achieved by alternate means, such as an alternative discharge site, a higher level of treatment, and/or improved treatment reliability; or
- A discharge is approved as part of a reclamation project; or
- It can be demonstrated that net environmental benefits will be derived as a result of the discharge; or
- A discharge is approved as part of a groundwater clean-up project, and in accordance with Resolution No. 88-160, "Regional Board Position on the Disposal of Extracted Groundwater from Groundwater Clean-up Projects," and it has been demonstrated that neither reclamation nor discharge to a POTW is technically and economically feasible, and the discharger has provided certification of the adequacy and reliability of treatment facilities and a plan that describes procedures for proper operation and maintenance of all treatment facilities. (The Regional Board recognizes the resource value of extracted and treated groundwater and urges its utilization for the highest beneficial use for which applicable water quality standards can be achieved.)

In reviewing requests for exceptions, the Regional Board will consider the reliability of the discharger's system in preventing inadequately treated wastewater from being discharged to the receiving water and the environmental consequences of such discharges.

Prohibitions 1 through 5 refer to particular characteristics of concern to beneficial uses. The Regional Board may consider an exception to Prohibition 4 provided that any proposed reclamation project demonstrates that beneficial uses will be protected. This broad language has been and will be interpreted by the Regional Board on a case-by-case basis. It should be noted that the Regional Board will consider all discharges of treated sewage and other discharges where the treatment process is subject to upset to contain particular characteristics of concern unless the discharger can demonstrate that the discharge of inadequately treated waste will be reliably prevented.

SUMMARY

The detailed program descriptions presented in the remainder of this chapter are focused on protecting water quality in systems ranging from small creeks to the larger Estuary.

The section on point source control focuses primarily on protecting beneficial uses in each segment of the Estuary, as well as the whole system. The section on nonpoint source control focuses primarily on individual watersheds, but also on the contributions of runoff to the larger Bay system. The section on groundwater protection and management centers on groundwater basins within each watershed. The section on emerging program areas describes resources and issues that have increasingly become the focus of Regional Board activity. Often, these areas require integrated and innovative approaches that are substantially different from those that exist in established programs.

SURFACE WATER PROTECTION AND MANAGEMENT — POINT SOURCE CONTROL

Surface waters in the region consist of inland surface water (freshwater lakes, rivers, and streams), estuaries, enclosed bays, and ocean waters. Historical and ongoing wasteloads contributed to the surface water bodies in the region come from upstream discharges carried into the region via Delta outflow, direct input in the forms of point and nonpoint sources, and indirect input via groundwater seepage.

A point source usually refers to waste emanating from a single, identifiable location, while a nonpoint source usually refers to waste emanating from diffuse locations. While legally considered point sources, stormwater sewer systems are discussed under the nonpoint source control program because waste entering the systems is generated from diffuse sources. This section describes control measures for point source discharges. The Regional Board may control either type of discharge, but approaches may differ.

TYPES OF POINT SOURCES

Wasteloads from point sources are those that are generally associated with pollutant discharges from an identifiable location to a specific receiving water body. Major types of point sources include:

- Treated municipal sewage discharged from Publicly Owned Treatment Works (POTWs), which often consist of a combination of domestic, industrial, and commercial waste streams;
- Treated industrial wastewater resulting from industrial operations, processing, cleaning, and cooling;
- Treated groundwater from cleanup of groundwater pollution sites; and
- Other miscellaneous types of discharges, including certain nonpoint sources with a physically identifiable point of discharge.

WASTE DISCHARGE PERMITTING PROGRAM

Point source discharges to surface waters are generally controlled through waste discharge requirements issued under federal National Pollutant Discharge Elimination System (NPDES) permits. Although the NPDES program was established by the federal Clean Water Act, the permits are prepared and enforced by the Regional Boards per California's delegated authority for the act.

Issued in five-year terms, an NPDES permit usually contains components such as discharge prohibitions, effluent limitations, and necessary specifications and provisions to en-sure proper treatment, storage, and disposal of the waste. The permit often contains a monitoring program that establishes monitoring stations at effluent outfall and receiving waters.

Under the state's Porter-Cologne Water Quality Control Act, any person discharging or proposing to discharge waste within the region (except discharges into a community sewer system) that could affect the quality of the waters of the state is required to file a Report of Waste Discharge (ROWD). The Regional Board reviews the nature of the proposed discharge and adopts Waste Discharge Requirements (WDRs) to protect the beneficial uses of waters of the state. Waste discharge requirements could be adopted for an individual discharge or for a specific type of discharge in the form of a general permit. The Regional Board may waive the requirements for filing a ROWD or issuing WDRs for a specific discharge where such a waiver is not against the public interest. NPDES requirements may not be waived.

Acceptable control measures for point source discharges must ensure compliance with NPDES permit conditions, including the

discharge prohibitions (Table 4-1) and the effluent limitations provided on the following pages. In addition, control measures must satisfy water quality objectives set forth in the Basin Plan unless the Regional Board judges that related economic, environmental, or social considerations merit a modification after a public hearing process has been conducted. Control measures employed must be sufficiently flexible to accommodate future changes in technology, population growth, land development, and legal requirements.

EFFLUENT LIMITATIONS

TECHNOLOGY- AND WATER QUALITY-BASED LIMITATIONS

The federal Clean Water Act (CWA) requires that NPDES permits include technology-based and, where appropriate, water quality-based effluent limitations. Technology-based effluent limitations are promulgated performance standards based on secondary treatment or best practicable control technology. When technology-based limitations fail to attain or maintain acceptable water quality (as measured by water quality objectives) or comply with water quality control plans, additional or more stringent effluent limitations will be required in order to attain water quality objectives. The more stringent limitations are known as water quality-based limits.

Water quality-based effluent limitations will consist of narrative requirements and, where appropriate, numerical limits for the protection of the most sensitive beneficial uses of the receiving water. Establishing numerical limits takes into account the appropriate water quality objectives, background concentrations in the receiving water, and allowable dilution credit. Descriptions of the calculation are included in the section below titled "Calculation of Water Quality-Based Effluent Limitations."

In many cases, numerical water quality objectives are not available for various types of beneficial uses or for various constituents of concern. U.S. EPA is expected to promulgate final water quality standards for California in late 1995. These standards will then apply to all permitting actions conducted under the federal Clean Water Act. In addition, the State Board is engaged in the development of statewide water quality objectives under Porter-Cologne. Prior to formal adoption or promulgation of applicable water quality objectives or standards, best professional judgement will be used in deriving numerical effluent limitations that will ensure attainment and maintenance of narrative water quality objectives.

SITE-SPECIFIC OBJECTIVES

In some cases, the Regional Board may elect to develop and adopt site-specific water quality objectives. These objectives will reflect site-specific conditions and comply with the Antidegradation Policy. This situation may arise when:

- It is determined that promulgated water quality standards or objectives are not protective of beneficial uses; or
- Site-specific conditions warrant less stringent effluent limits than those based on promulgated water quality standards or objectives, without compromising the beneficial uses of the receiving water.

In the above cases, the Regional Board may consider developing and adopting site-specific water quality objectives for the constituent(s) of concern. These site-specific objectives will be developed to provide the same level of environmental protection as intended by national criteria, but will more accurately reflect local conditions. Such objectives are subject to approval by the State Board, the Office of Administrative Law, and U.S. EPA.

There may be cases where the promulgated water quality standard or adopted objectives are practically not attainable in the receiving water due to existing high concentrations. In such circumstances, discharges shall not cause impairment of beneficial uses.

BEST PROFESSIONAL JUDGEMENT

In developing and setting water quality-based effluent limitations for toxic pollutants, best professional judgement will involve consideration of many factors. Factors that may be considered include:

- Applicable and relevant federal laws, regulation, and guidance (specifically 40 CFR 122 and 131, promulgated National Toxics Rules, U.S. EPA Water Quality Criteria, and technical guidance on water quality-based toxics control);
- State laws, regulations, policies, guidance, and Water Quality Control Plans;
- This regional Water Quality Control Plan;
- Achievability by available technology or control strategies;
- Effectiveness of pollution prevention and source control measures; and

- Economic and social costs and benefits.

While the conditions surrounding a waste discharge may vary from case to case, all attempts will be made to ensure consistency among permits when exercising best professional judgement.

EFFLUENT LIMITATIONS

The effluent limitations described below have been established to help achieve the water quality objectives identified in Chapter 3.

Numerical effluent limitations identified in this section may not contain a complete list of pollutants that have a reasonable potential to cause an adverse impact on water quality. Inclusion of such pollutants of concern into the NPDES permit will be evaluated on a case-by-case basis.

The Regional Board will consider establishing more stringent limitations as necessary to meet water quality objectives and protect beneficial uses in particularly sensitive areas. Similarly, the Regional Board will consider establishing less stringent limitations, consistent with state and federal laws, for any discharge where it can be conclusively demonstrated through a comprehensive program approved by the Regional Board that such limitations will not result in unacceptable adverse impacts on the beneficial uses of the receiving water. Such a comprehensive program must evaluate the impact of other, nearby discharges as well as the discharge itself.

The numerical limits identified in this section have been and will be applied on a gross rather than a net basis except for certain industrial waste discharges, which will be evaluated on a case-by-case basis.

A. DISCHARGES TO OCEAN WATERS

Within the context of this Plan, ocean waters of the region are all territorial marine waters of the state west of the coastline, except enclosed bays.

All discharges to ocean waters must comply with the applicable requirements for waste discharges specified in the State Board's Ocean Plan and Thermal Plan.

B. DISCHARGES TO INLAND SURFACE WATERS, ENCLOSED BAYS, AND ESTUARIES

Within the context of this Plan, enclosed bays are the indentations along the coast that enclose an area of marine water (such as Tomales Bay and Drake's Estero), including San Francisco Bay; estuaries extend from a bay to points upstream where there is no significant mixing of fresh water and sea water (this includes significant portions of the main San Francisco Bay and the portions of streams draining to the Bay where salt and fresh water mix); and inland surface waters are all other waterbodies within the region (freshwater rivers, streams, lakes, and reservoirs). As described in Chapter 3, effluent limits for discharge into any surface-water body within the region are based on salinity. These are defined in the State Enclosed Bays and Estuaries Policy, 1974.

LIMITATIONS FOR CONVENTIONAL POLLUTANTS

Effluent limitations for conventional pollutants are contained in Table 4-2 for discharges to inland surface waters and enclosed bays and estuaries within the region.

LIMITATIONS FOR SELECTED TOXIC POLLUTANTS

Effluent limitations for selected toxic pollutants are listed in Table 4-3 for discharges to shallow water and deep water. In order to be classified as a deepwater discharge, waste must be discharged through an outfall with a diffuser and must receive a minimum initial dilution of 10:1, with generally much greater dilution. All other discharges are classified as shallow water discharges.

[The effluent limitations listed in Table 4-3 were adopted in the 1986 Basin Plan and have subsequently been incorporated into NPDES permits where appropriate. Certain limitations (e.g., copper, mercury, and PAHs) are no longer considered to be protective of beneficial uses. However, the Regional Board intends to retain the entire Table 4-3 based on consideration of the anti-backsliding policy.]

The Regional Board may adopt additional numerical standards for conservative constituents documented in discharges and/or documented to be of concern in receiving waters.

ALTERNATE LIMITS

The Regional Board will consider proposals consistent with the State Board's Resolution No. 68-16 and federal Antidegradation Policy for alternate limits for each of the pollutants in Tables 4-2 and 4-3 where the discharger:

(1.a) Demonstrates that all sources of the toxic pollutant are being controlled through application of all reasonable treatment and source control measures. Such proposals must include an assessment of the impact of the alternate effluent limit on the beneficial uses of the receiving water and must include a demonstration that the costs of

additional measures do not bear a reasonable relationship to the level of beneficial uses protected by such additional measures; or

(1.b) Proposes an alternate effluent limit based on a site-specific water quality objective for that location, addressing three specific aspects of uncertainty: (i) site-specific water chemistry and constituent speciation, (ii) background concentration(s) in receiving waters, and (iii) differences in sensitivity between local species and species used to develop U.S. EPA criteria; and

(2) Participates in a program to identify and develop control strategies for nonpoint sources of pollution (urban runoff, agricultural drainage, etc.) within or upstream from that discharger's receiving water segment to reduce uncertainty regarding the discharger's contribution to the total pollutant load.

WHOLE EFFLUENT TOXICITY LIMITS AND CONTROL PROGRAM

The narrative water quality objective for toxicity (see Chapter 3) protects beneficial uses against mixtures of pollutants typically found in aquatic systems. This approach is used because numerical objectives for individual pollutants do not take mixtures into account and because numerical objectives exist for only a small fraction of potential pollutants of concern.

Effluent limits for acute toxicity are described below and were derived through the Effluent Toxicity Characterization Program (ETCP). A detailed description of the ETCP is presented later in this section. These limits define in specific terms how the Regional Board assesses whether waters are "maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms" (the narrative objective in Chapter 3) and maintains waters free of "toxic substances in toxic amounts" (Clean Water Act).

ACUTE TOXICITY

The acute toxicity effluent limitation states that the survival of organisms in effluent shall be a median value of not less than 90 percent survival, and a 90 percentile value of not less than 70 percent survival, using tests as specified in Table 4-4 and Table 4-5.

Compliance with the acute toxicity limitation is evaluated by measuring survival of test fishes exposed to effluent for 96 hours. Each fish species represents a single sample. Dischargers are required to conduct flow-through effluent toxicity tests, except for those that discharge intermittently and discharge less than 1.0 million gallons per day (average dry weather flow). Such small, intermittent dischargers are required to perform static renewal bioassays.

All dischargers perform toxicity tests using fish species, according to protocols approved by U.S. EPA or the State Board or published by the American Society for Testing and Materials (ASTM) or American Public Health Association. Two fish species shall be tested concurrently. These shall be the most sensitive two species determined from concurrent screening(s) of three species: three-spine stickleback, rainbow trout, and fathead minnow. Tests completed within ten days of the initial test are considered concurrent. This three-species-screening requirement can be met using either flow-through or static renewal bioassays.

The Regional Board may consider allowing compliance monitoring with only one (the most sensitive, if known) fish species, if the following condition is met: the discharger can document that the acute toxicity limitation, specified above, has not been exceeded during the previous three years, or that acute toxicity has been observed in only one of two fish species.

The Regional Board may modify the flow-through bioassay requirements and the specific test species requirements on a case-by-case basis for discharges of once-through cooling water or excessively saline wastes, which make the implementation of these test requirements impractical. Such changes are not intended as a reduction in the acute toxicity limitation, but rather to account for the technical difficulties of performing the tests.

In addition, for deepwater discharges subject to marine effluent limitations, dischargers are not to be considered out of compliance with the acute toxicity effluent limitation under the following circumstances: the discharger documents that the only cause of acute toxicity is ammonia, which rapidly decays in the receiving water, and demonstrates that ammonia in the discharge does not impact water quality or beneficial uses.

CHRONIC TOXICITY

Chronic toxicity effluent limits are derived for individual dischargers based upon Best Professional Judgement. Some of the factors that may be considered in the development of these limits include: allowing credit for dilu-

tion comparable to those allowed for numerical chemical-specific objectives, effluent variability, and intent to protect against consistent chronic toxicity and severe episodic toxic events.

Chronic toxicity limitations are contained in the permits of all dischargers that have completed or are currently participating in the Effluent Toxicity Characterization Program (ETCP). This includes all municipal facilities with pretreatment programs, all major industrial facilities, and selected treated groundwater dischargers.

Monitoring requirements for chronic toxicity, such as test species, effluent sampling procedures, dilution series, monitoring frequency, dilution waters, and reference toxicant testing requirements, are specified in NPDES permits on a case-by-case basis. Monitoring requirements will be based on Effluent Toxicity Characterization Program data. Test species and protocols will be selected from those listed in Table 4-5.

Dischargers with chronic toxicity limits in their permits monitoring quarterly or less frequently are required to accelerate the frequency to monthly (or as otherwise specified by the Executive Officer) when conditions listed in Table 4-6 occur.

TOXICITY IDENTIFICATION/REDUCTION EVALUATION (TIE/TRE)

Permits shall require that if consistent toxicity is exhibited, then a chronic toxicity identification evaluation (TIE) and toxicity reduction evaluation (TRE) shall be conducted. Specific language in permits requires the development of workplans for implementing TIEs. TIEs will be initiated within 30 days of detection of persistent toxicity. The purpose of a TIE is to identify the chemical or combination of chemicals causing the observed toxicity. Every reasonable effort using currently available TIE methodologies shall be employed by the discharger. The Regional Board recognizes that identification of causes of chronic toxicity may not be successful in all cases.

The purposes of a TRE are to identify the source(s) of the toxic constituents and evaluate alternative strategies for reducing or eliminating their discharge. The TRE shall include all reasonable steps to reduce toxicity to the required level. In addition, the Regional Board will review chronic toxicity test results to assess acute toxicity and consider the need for an acute TIE.

Following completion of the TRE, if consistent toxicity is still exhibited in a discharge, then the discharger shall pursue all feasible waste minimization measures at a level that is acceptable to the Regional Board. The discharger must document that the acceptable level of participation is maintained by submitting reports to the Regional Board according to a specified schedule.

A toxicity reduction evaluation may again be required in situations where chronic toxicity still exists and new techniques for identifying and reducing toxicity become available. Alternatively, the cause of effluent toxicity may change, so that existing techniques will enable identification and reduction of toxicity.

Consideration of any enforcement action by the Regional Board for violation of the effluent limitation will be based in part on the discharger's actions in identifying and reducing sources of persistent toxicity.

EFFLUENT TOXICITY CHARACTERIZATION PROGRAM

The Effluent Toxicity Characterization Program was initiated in 1986 with the goal of developing and implementing toxicity limits for each discharger based on actual characteristics of both receiving waters and waste streams. The Regional Board initiated the program as a means of implementing the narrative objective prohibiting toxic effects in receiving water.

The first two phases of the program focused on developing methods for monitoring effluent toxicity (known as effluent characterization) and deriving the appropriate series of tests to ensure that each effluent and its immediate receiving waters are not toxic to aquatic organisms.

Information from these phases is used to determine whether the narrative objectives are being met in each segment of the Bay and will support the development of site-specific water quality objectives and wasteload allocations.

As the program progresses, the Regional Board may (a) modify existing effluent limits; (b) specify different test organisms and methods for determining compliance with toxicity effluent limits; and/or (c) require a toxicity reduction evaluation (TRE) to determine the cost-effectiveness of controlling toxicity or reducing concentrations of specific pollutants.

This program is being implemented within the existing framework of the NPDES permitting program for municipal and industrial facilities.

The purposes of effluent characterization are to:

- Define effluent variability so that the most appropriate compliance monitoring program can be put in place for each discharge and so that adequate information can be developed to determine if treatment processes or source control modifications are necessary to comply with effluent limits;
- Define the sensitivity of different test species to different effluents so that appropriate acute toxicity effluent limits can be defined and to identify the most sensitive of a group of test organisms used for compliance monitoring; and
- Define the chronic toxicity of the effluent to different test species such that the most sensitive organism of a standard set can be defined and either used for compliance monitoring or used for development of application factors to be applied to the acute toxicity effluent limit.

Two rounds of effluent characterization have been completed by dischargers selected on the basis of the nature, volume, and location of discharge. The first round started characterization in 1988; the second round in 1991. The Regional Board adopted guidance documents for each round of characterization, with modifications made to the second round from knowledge gained during the first. Status reports were issued in July, 1989; March, 1990; and July, 1991. A summary report is scheduled upon completion of the second round in 1995. The need for a third round of characterization will be evaluated at that time.

Thus far, no one test species has consistently been the most sensitive to all discharges. This strongly supports the current approach of requiring screening using several test species. Also, acute toxicity has been observed at several sites using the expanded range of test species.

Although these sites can meet existing limits with test species currently used to determine compliance (fathead minnow, trout, and stickleback), they cannot meet the limits based on more sensitive species now available.

Detailed technical guidelines for conducting toxicity tests and analyzing resulting data were compiled in "Modified Guidelines: Effluent Toxicity Characterization Program," San Francisco Bay Regional Water Quality Control Board, 1991, Resolution No. 91-083, after experience gained during the first round. This document is incorporated by reference into this plan.

CALCULATION OF WATER QUALITY-BASED EFFLUENT LIMITATIONS

Water quality-based effluent limitations shall be calculated from water quality objectives based on the following equation:

$$C_e = C_o + D(C_o - C_b)$$

where,

C_e = the effluent limitation for the substance;

C_o = the water quality objective for the substance;

D = the assigned dilution ratio for the discharge, as described in the section below entitled Dilution Ratios;

C_b = the ambient background concentration as shown in Table 4-7 in the section below entitled Background Concentrations.

The above equation applies to cases where ambient concentrations are equal to or less than the water quality objective. In some cases, the Antidegradation Policy and antibacksliding policy may result in more stringent effluent limitations than indicated by the formula.

DILUTION RATIOS

The allocation of dilution ratio depends on whether a discharge is classified as a deep water or a shallow water discharge.

DEEP WATER DISCHARGES

The effluent limitations for deepwater discharges were calculated using a dilution ratio of 10:1 or D=9. While it is recognized that the actual initial dilution of many deepwater discharges is greater than ten, the Regional Board has taken this conservative approach to calculating effluent limitations for the following reasons. First, there is concern over the effects of the cumulative mass loadings of toxic pollutants from the numerous discharges into San Francisco Bay. Limiting the allocation of dilution credits is one means of limiting mass loadings. Second, recent Regional Board studies have detected toxicity in ambient waters throughout the Bay system based on laboratory toxicity tests. This calls for a cautious approach in allowing the discharge of toxic substances. Third, it is difficult to either measure or predict actual dilution in the San Francisco Bay estuarine environment. In the Estuary, the direction of waste transport varies over the course of the tidal cycle, so it is difficult to determine the fraction of new water versus recirculated water mixing with the discharge. U.S. EPA

has developed several models of initial dilution for discharge plumes, but none take into account transport due to tidal currents.

The Regional Board will consider inclusion of an effluent limitation greater than that calculated from water quality objectives when the increase in concentration is caused by implementation of significant water reclamation or water reuse programs at the facility; the increase in the effluent limitation does not result in an increase in the mass loading; and water quality objectives will not be exceeded outside the zone of initial dilution.

SHALLOW WATER DISCHARGES

The effluent limitations for shallow water discharges were calculated assuming no dilution, or D=0. In other words, the effluent limitation is equal to the objective. Background concentrations are not taken into account in this case because no dilution credit is granted.

Shallow water dischargers may apply to the Regional Board for exceptions to the assigned dilution ratio of D=0 (and thus to the shallow water effluent limitations) based on demonstration of compliance with water quality objectives in the receiving waters. Exceptions will only be considered on a pollutant-by-pollutant basis where an aggressive pretreatment and source control program is in place, including the following:

- Completion of a source identification study;
- Development and implementation of a source reduction plan; and
- Commitment of resources to fully implement the source control and reduction plan.

Exception will be granted only if needed to meet effluent limits and only after very rigorous scrutiny of source control efforts and receiving water data. When exceptions are granted, permits shall include provisions requiring continuing efforts at source control, targeting the substances to which the exceptions apply.

For certain low volume, short duration, or one-time discharges, the requirements of pretreatment and source control programs may not be practical. The Regional Board may choose to waive such requirements for pollutants in low volume discharges determined to have no significant adverse impact on water quality.

The demonstration of compliance with objectives shall address the following issues:

(a) A demonstration that the proposed effluent limitation will result in compliance with water quality objectives, including the narrative chronic toxicity objective, in the receiving water. Water quality objectives used in this demonstration are to be based on ambient salinity and hardness (for fresh waters) at the time of sampling. In addition, demonstration of compliance is to be based on the averaging period associated with each objective. Compliance with both acute and chronic chemical-specific water quality objectives shall be demonstrated. If freshwater objectives apply in the receiving waters (i.e., salinity is less than 5 parts per thousand), compliance with saltwater objectives shall also be demonstrated at the nearest point in the receiving waters where salinity reaches 5 parts per thousand. Such a demonstration shall be based on ambient monitoring at a frequency equal to that typically required for effluent monitoring for a period of time defined in the study plan;

(b) An evaluation of worst-case conditions (in terms of tidal cycle, currents, or instream flows, as appropriate) through monitoring and/or modeling to demonstrate that water quality objectives will continue to be met, taking into account the averaging period associated with each objective; and

(c) An evaluation of the effects of mass loading resulting from allowing higher concentrations of pollutants in the discharge, in particular, the potential for accumulation of pollutants in aquatic life or sediments to levels that would impair aquatic life or threaten human health. This evaluation may include sampling of sediment and biota in the vicinity of the discharge to determine the accumulation of pollutants resulting from the current levels of discharge.

A study plan for conducting this work must be submitted to the Regional Board for approval by the Executive Officer. Results of the study or studies addressing these three points shall be submitted to the Regional Board. Effluent limitations based on either concentration or mass loading shall be developed for consideration by the Regional Board based on study results and any other available information. The goal in setting effluent limitations shall be to ensure that water quality objectives are met in the receiving water and that mass loadings are limited to a level that provides protection of beneficial uses. In no

case shall effluent limitations be greater than the deepwater effluent limitations or impair the basis upon which exception to the prohibition against discharge to shallow water was granted. Continued ambient monitoring shall also be required to ensure that water quality objectives are met.

FRESH WATER VS. MARINE WATER

Due to the unique estuarine environment that exists in the region, the salinity characteristics (i.e., fresh water vs. marine water) of the receiving water shall be considered in establishing water quality objectives. Freshwater effluent limitations shall apply to discharges to waters both outside the zone of tidal influence and with salinities lower than 5 parts per thousand at least 75 percent of the time in a normal water year. Marine effluent limitations shall apply to discharges to waters with salinities greater than 5 parts per thousand at least 75 percent of the time in a normal water year, except for discharges to the Pacific Ocean, which are covered by the California Ocean Plan. For discharges to waters with salinities in between these two categories or to tidally influenced fresh waters that support estuarine beneficial uses, effluent limitations shall be the lower of the marine or freshwater effluent limitation, based on ambient hardness, for each substance.

BACKGROUND CONCENTRATIONS

When dilution credit is granted, the background concentration of the substance is taken into account in calculating effluent limitations so that the dilution provided by mixing with receiving waters is not overestimated. Ambient background concentration means the median concentration of a substance, in the vicinity of a discharge, which is not influenced by the discharge. For the San Francisco Estuary, it is difficult to identify a location that is not influenced by a discharge. Furthermore, background concentrations should vary within the Estuary due to changing geochemistry of the waters as they travel downstream. However, in order to simplify the calculation of effluent limitations, it is desirable to use one background concentration throughout the region.

Table 4-7 shows a first approximation of natural background concentrations for metals in salt and fresh water. For substances not included in Table 4-7, the background concentrations were assumed to be zero in calculating effluent limitations. As additional data become available, the Basin Plan may be amended to add background concentrations for other substances.

Discharges to the South Bay south of the Dumbarton Bridge are not obligated to comply with the effluent limits contained in Table 4-3 because of their unique situations as described in Chapter 3. However, they are obligated to perform specific, detailed work identified in the Municipal Facilities section of this chapter that will result in the development of site-specific water quality objectives, effluent limits, and other control measures.

The Regional Board will adopt schedules for developing site-specific water quality objectives and for possibly revising effluent limits when it considers the requests of the South Bay dischargers for exemptions from the discharge prohibitions for their current locations.

IMPLEMENTATION OF EFFLUENT LIMITATIONS

In incorporating and implementing effluent limitations in NPDES permits, the following general guidance shall apply:

(A) PERFORMANCE-BASED LIMITS

Where water quality objectives in the receiving water are being met, and an existing effluent limitation for a substance in a discharge is significantly lower than appropriate water quality-based limits, performance-based effluent limitations for that substance may be specified or the effluent limit revised. Any changes are subject to compliance with the state Antidegradation Policy. The performance-based effluent limitation may be either concentration- or mass-based, as appropriate.

(B) SITE-SPECIFIC OBJECTIVE INCORPORATION

Once the Regional Board has adopted a site-specific objective for any substance, effluent limitations shall be calculated from that objective in accordance with the methods described above.

(C) AVERAGING PERIODS

For some substances there may be more than one effluent limitation with different averaging periods (e.g., daily average and 30-day average). In both cases, the effluent limitations shall apply to the mean concentration of all samples analyzed during the averaging period. If only one sample is taken during the averaging period, the effluent limitation applies to the concentration of that sample.

(D) METHOD DETECTION LIMITS, PRACTICAL QUANTITATION LEVELS (PQL), AND LIMITS OF QUANTIFICATION (LOQ)

Method Detection Limits are defined in Title 40, Code of Federal Regulations, Part 136, Appendix B (revised June 30, 1986).

Practical Quantitation Level is the lowest concentration of a substance within plus or minus 20 percent of the true concentration by 75 percent of the analytical laboratories testing in a performance evaluation study. If performance data are not available, the PQL is the MDL x 5 for carcinogens and the MDL x 10 for noncarcinogens.

Limits of Quantification is ten standard deviations greater than the average measured blank values used in developing the MDL.

These terms and concepts are useful when pollutant concentrations in waters are relatively low. However, these will be taken into account in determining compliance with, rather than in the calculation of, effluent limitations.

(E) SELECTION OF PARAMETERS

Effluent limits are not necessary for substances that do not pose any risk to beneficial uses or are shown not to be present in discharge. However, a discharger must demonstrate to the satisfaction of the Regional Board that particular substances do not cause, or have the reasonable potential to cause or contribute to an excursion above numerical and narrative objectives. Dischargers must also demonstrate that pollutants of concern are (a) not in the waste stream, and (b) no change has occurred that may cause release of pollutants. This certification shall be supported, at a minimum, by monitoring results for such pollutants and process and treatment descriptions that demonstrate these substances are not expected to be present in the waste stream. At a minimum, this monitoring and certification is required prior to issuance and reissuance of WDRs.

The Regional Board may choose to not require periodic monitoring and certification for pollutants in low volume discharges determined to have no significant adverse impact on water quality.

(F) COMPLIANCE SCHEDULES

As new objectives or standards are adopted, permits will be revised accordingly. Revised permits will distinguish between effluent limitations that are met by current performance and effluent limitations not currently attained. Immediate compliance will be required for effluent limitations that are met by current performance.

The Regional Board may consider dischargers' proposals for longer compliance schedules for newly adopted objectives or standards as NPDES permit conditions for particular substances, where revised effluent limitations are not currently being met and where justified. The primary goal in setting compliance schedules is to promote the completion of source control and waste minimization measures, including water reclamation.

Justification for compliance schedules will include, at a minimum, all of the following:

(a) Submission of results of a diligent effort to quantify pollutant levels in the discharge and the sources of the pollutant in the waste stream;

(b) Documentation of source control efforts currently underway or completed, including compliance with the Pollution Prevention program described in the Basin Plan;

(c) A proposed schedule for additional source control measures or waste treatment; and

(d) A demonstration that the proposed schedule is as short as possible.

Implementation of source control measures to reduce pollutant loadings to the maximum extent practicable shall be completed as soon as possible, but in no event later than four years after new objectives or standards take effect. Implementation of any additional measures that may be required to comply with effluent limitations shall be completed as soon as possible, but in no event later than ten years after new objectives or standards take effect. The issuance of the permit containing a compliance schedule should not result in a violation of any applicable requirement of the federal Clean Water Act or the California Water Code, including any applicable Clean Water Act statutory deadlines.

STORMWATER DISCHARGES

As discussed in a later section titled "Urban Runoff Management," the Regional Board has initiated a program that regulates certain municipal, industrial, and construction stormwater discharges through NPDES permits. Since both the sources of pollutants in stormwater discharges and the points of discharge are diffuse, and the methods of reduc-

ing pollutants in stormwater discharges are in the development stage, water quality-based numerical effluent limitations are not feasible at this time. Instead, stormwater permits will include requirements to prevent or reduce discharges of pollutants that cause or contribute to violations of water quality objectives. Compliance with these requirements is expected to be achieved through implementation of control measures or best management practices identified in dischargers' stormwater management plans or stormwater pollution prevention plans.

The Regional Board is taking a phased approach towards attainment of water quality objectives in waters that receive stormwater discharges from urban areas and certain industrial and construction activities. The Regional Board will first require entities subject to NPDES permits for stormwater discharges to complete implementation of technically and economically feasible control measures to reduce pollutants in stormwater to the maximum extent practicable. For industrial facilities, such control measures include those representing the best available technology that is economically achievable.

NPDES permits for stormwater discharges will require completion of technically and economically feasible control measures as soon as possible. Specific schedules for implementing control measures may, at the discretion of the Regional Board, be included in permits (to the extent that such schedules are authorized by state or federal laws) either by reference to a stormwater management plan or by permit conditions. In no event will these schedules extend beyond the term of the permit.

If this first phase does not result in attainment of water quality objectives, the Regional Board will consider permit conditions that may require implementation of additional control measures. In such circumstances, the Regional Board may consider dischargers' proposed schedules for identification and implementation of additional control measures designed to attain water quality objectives. Such schedules shall be as short as practicable and will only be considered for inclusion in permits when a discharger has demonstrated the following:

(a) A diligent effort to quantify pollutant levels and the sources of the pollutant in stormwater discharges; and

(b) Documentation of completion of implementation of all technically and economically reasonable control measures.

WET WEATHER OVERFLOWS

During periods of heavy rainfall, large pulses of water enter sewerage systems. When these pulses exceed the collection, treatment, or disposal capacity of a sewerage system, overflows occur. This is especially problematic for sewer systems that combine both sanitary sewage and stormwater (combined sewer systems or CSS), such as the City and County of San Francisco's system (also discussed below under the Municipal Facilities section). All other municipalities in the region operate two distinct sewer systems. Wet weather is also problematic for separate systems because more water infiltrates the pipes leading to treatment plants. This problem is commonly referred to as infiltration/inflow (I/I). In either case, pulses of water during wet weather may cause untreated or partially treated wastewater to be discharged directly to surface water bodies.

Wet weather overflows of wastewater affect three types of beneficial uses: water contact recreation, noncontact water recreation, and shellfish harvesting. The water quality characteristics that could adversely affect these beneficial uses are pathogens, oxygen-demanding pollutants, suspended and settleable solids, nutrients, toxics, and floatable matter.

FEDERAL COMBINED SEWER OVERFLOW CONTROL POLICY

On April 11, 1994, U.S. EPA adopted the Combined Sewer Overflow (CSO) Control Policy (50FR 18688). This policy establishes a consistent national approach for controlling discharges from CSOs to the nation's water. Using the NPDES permit program, the policy initiates a two-phased process with higher priority given to more environmentally sensitive areas. During the first phase, the permittee is required to implement the following nine minimum controls. These constitute the technology-based requirements of the Clean Water Act as applied to combined sewer facilities (best conventional treatment, BCT, and best available treatment, BAT). These nine minimum controls can reduce CSOs and their effects on receiving water quality:

(1) Conduct proper operation and regular maintenance programs for the CSS and the CSO outfalls;

(2) Maximize use of the collection system for storage;

(3) Review and modify pretreatment programs to ensure that CSO impacts are minimized;

(4) Maximize flow to the POTW for treatment;

(5) Prohibit CSOs during dry weather;

(6) Control solids and floatable materials in CSOs;

(7) Develop and implement pollution prevention programs that focus on contaminant reduction activities;

(8) Notify the public; and

(9) Monitor to effectively characterize CSO impacts and the efficacy of CSO controls.

Compliance with the minimum controls shall be as soon as practicable, but no later than January 1, 1997. The permittee is also required to initiate development of a long-term control plan to select CSO controls, based on consideration of the permittee's financial capability.

The second phase of the process involves implementation of the long-term control plan developed in the first phase. Such implementation must provide for the attainment of water quality objectives and may result in additional site-specific technology-based controls, as well as water quality-based performance standards that are established based on best professional judgement. While numerical water quality-based effluent limits are not readily established due to unpredictability of a storm event and the general lack of data, the CSO Control Policy requires immediate compliance with water quality standards expressed in the form of a narrative limitation.

The Regional Board intends to implement the federal CSO Control Policy for the combined sewer overflows from the City and County of San Francisco. The City and County of San Francisco has substantially completed implementation of the long-term CSO control plan (and is thereby exempted from the requirements of preparing a long-term control plan).

Additionally, the following is the Regional Board's recommended approach to controlling the seasonal degradation of water quality that results from all wet weather overflows of wastewater, including POTWs with either combined and separate sewer systems, and industrial wastewater facilities. The overflow from San Francisco's combined sewer system is addressed by the CSO Control Policy described above.

CONCEPTUAL APPROACH

The recommended approach to controlling wet weather overflows of wastewater that contains particular characteristics of concern to beneficial uses is a combination of designated alternative levels of maintenance (i.e., combination of treatment levels and beneficial use protection categories) and guidance for the design of overflow discharge structures. The Regional Board is not endorsing any specific control measures, but is presenting a conceptual framework that allows for the evaluation of costs and benefits. This framework can be used as guidance in adopting specific control measures. As with all of its programs, the Regional Board will implement this conceptual approach consistent with the national goal of achieving "water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water."

Maintenance and associated treatment and overflow requirements are detailed in Table 4-8. The following requirements should be met for all overflows:

(a) Outfalls achieve an initial dilution of 10:1;

(b) Overflows receive treatment to remove large visible floatable material and to protect the outfall system; and

(c) Overflow locations be removed from dead-end sloughs and channels, and from close proximity to beaches and marinas.

Exceptions to (a) and (c) will be considered where an inordinate burden would be placed on the discharger relative to beneficial uses protected, and when an equivalent level of environmental protection can be achieved by alternative means, such as an alternative discharge site, a higher level of treatment, and/or improved treatment reliability.

The conceptual approach described above will be used by the Regional Board in evaluating wet weather discharge conditions where polluted stormwater or process wastewater bypasses any treatment unit or units that are used in the normal treatment of the waste stream. Evaluation of such discharges must include identification of:

- Actual capacities of the collection system, each treatment unit, and the disposal system;
- Flow return period probabilities for the specific facility location;
- Cost of providing complete storage or treatment capacity and disposal capacity for flow return periods of 1, 5, and 20 years;

- Quality of the polluted stormwater and process wastewater for flow return periods of 1, 5, and 20 years; and
- Beneficial uses that may be affected by such discharges.

SURFACE IMPOUNDMENT OVERFLOW PROTECTION

In providing protection of waste management units against wet weather overflows, Chapter 15 (Title 23, California Code of Regulations) requires that surface impoundments must have sufficient freeboard to accommodate seasonal precipitation and precipitation conditions specified for each class of waste management unit. Those specified precipitation conditions are probable maximum precipitation for Class I units; and the 1000-year, 24-hour precipitation for Class II units.

To guarantee the protection of water quality, the Regional Board will interpret seasonal precipitation to be the 100-year return period wet season for Class I units and the 10-year return period wet season for Class II units. The sources to be used for determining the applicable precipitation for a given return period and location are California Department of Water Resources Bulletin No. 195 (or any update by the Department), local water agency publications, or other sources approved by the Executive Officer.

DISCHARGE OF TREATED GROUNDWATER

Cleanup of groundwater contamination sites often includes groundwater extraction, and thus creates the need for proper disposal of treated groundwater. The majority of the groundwater pollution cases of the region involve surface spills, pipeline breaks, or leakages from tanks, vaults, sumps, surface impoundments, or landfills. Toxic pollutants commonly found in groundwater range from solvents (including volatile and semi-volatile organic compounds), petroleum hydrocarbons, heavy metals, or a combination of these pollutants. In many cases, the treated groundwater is discharged to surface waters via storm drains. These direct discharges would normally require an exception to the prohibitions against discharge into shallow or nontidal waters.

To address this issue, the Regional Board adopted Resolution No. 88-160 (see Chapter 5). The resolution urges dischargers of groundwater extracted from site clean-up projects to reclaim their effluent. When reclamation is not technically and/or economically feasible, discharges must be piped to a municipal treatment plant. Furthermore, as required in State Board Resolution 89-21 (see Chapter 5), the Regional Board recognizes the resource value of the extracted and treated groundwater and urges its utilization for the highest beneficial use for which applicable water quality standards can be achieved.

The Regional Board will consider granting an exception to the discharge prohibitions only if (a) it has been demonstrated that neither reclamation nor discharge to a POTW is technically or economically feasible, and (b) beneficial uses of the receiving water are not adversely affected. Such an exception is based on the Regional Board's recognition that discharges allowed under the exception are an integral part of a program to clean up polluted groundwater and thereby produce an environmental benefit.

Dischargers shall demonstrate that their groundwater extraction and treatment systems and associated operation, maintenance, and monitoring plans constitute acceptable programs for minimizing the discharge of toxic substances and for complying with effluent limitations deemed necessary for protection of the beneficial uses of receiving waters.

Applications for NPDES permits to discharge treated groundwater directly to surface waters will be evaluated on a case-by-case basis. However, the Regional Board has adopted general NPDES permits for the following two types of groundwater clean-up projects:

(a) Groundwater polluted by fuel leaks and other related wastes at service stations and similar sites (adopted on April 17, 1991, in Order No. 91-056, NPDES No. CA0029815); and

(b) Groundwater polluted by volatile organic compounds (VOCs) (adopted on July 20, 1994, in Order No. 94-087, NPDES No. CAG912003).

The general permits were intended to streamline a common regulatory process. The Regional Board may renew, revise, or rescind the permits if deemed appropriate.

In establishing effluent limitations, no dilution credit was allowed in the general permits for primary pollutants of concern. However, ambient levels of heavy metals in groundwater may sometimes result in exceedances of effluent limitations that did not provide allowance for dilution. This is especially a

concern for cleanup of groundwater polluted with VOCs when heavy metals were not contributed to the environment. The inadvertent discharge of background metals would be a result of the effort to extract groundwater for the removal of VOCs. A study conducted by Regional Board staff in 1993 concluded that metals concentrations in the effluent of these groundwater discharges would sometimes exceed effluent limitations with zero dilution credit, but would rarely exceed concentrations of twice of such limits. As a result, the general permit adopted for cleanup of VOCs-polluted groundwater (Order No. 94-087) sets heavy metals effluent limitations based on a 1:1 dilution credit.

Consideration for allowing limited dilution credit in this case is based on reasons that are unique to the specific type of groundwater clean-up discharges that are temporary and are due to non-metal contamination. Metal mass loading to the Bay from these discharges is insignificant compared to other sources, and the dischargers usually have no feasible way to reduce the loadings. However, special studies shall be required in the event of any chronic violations of such metals limits.

MUNICIPAL FACILITIES

Table 4-9 lists municipal wastewater treatment facilities (excluding wet weather facilities) within the region that discharge directly into surface waters. Figure 4-1 shows where these facilities are located in the region. Under normal operational conditions, these POTWs provide a minimum of secondary treatment. In addition, more than 30 percent of the total flow receives advanced treatment.

Brief discussions of the issues specific to the City and County of San Francisco, the South Bay dischargers, the Fairfield-Suisun Sewer District, the Livermore-Amador Valley, and the East Bay Municipal Utilities District are presented below.

CITY AND COUNTY OF SAN FRANCISCO

The City and County of San Francisco collects wastewater in a combined sewer system. That is, the domestic sewage, industrial wastewater, and stormwater runoff are all collected in the same pipes (combined sewer). Such a system is subject to overloading during severe storms. Most other communities in California have a separated sewer system: one set of pipes for domestic sewage and industrial wastes and another set for stormwater.

San Francisco is near completion of the primary components of its wastewater facilities master plan. This construction program began in 1974 with the publication of the "Master Plan Environmental Impact Statement and Report." The integrated wastewater control system established by the master plan has been designed to provide control and treatment for both dry weather sewage and wet weather storm flows. All dry weather flows currently receive secondary level treatment. At program completion in 1996, all wet weather flows, including stormwater runoff, will be captured and will receive a specified level of treatment depending on the size of the storm. Pollutant removal from stormwater will be approximately 60 percent systemwide (measured as reduction in total suspended solids).

San Francisco is one of the first municipalities in the nation to complete a comprehensive control program for a combined sewer system. The expenditure for completing the wastewater master plan is about $1.45 billion.

The Southeast Water Pollution Control Plant is a major component of San Francisco's wastewater treatment system. The plant provides secondary-level treatment for all dry weather domestic and industrial wastewater from the Bayside drainage area in San Francisco (approximately 75 percent of the total citywide flow). The Oceanside plant provides similar treatment on the west side. The storage/transports around the periphery of the city store combined sewage for treatment after the storms subside. Additionally, northeast zone storm flows receive treatment at the Northpoint wet weather treatment plant.

SOUTH BAY MUNICIPAL DISCHARGERS (SAN JOSE/ SANTA CLARA, PALO ALTO, AND SUNNYVALE)

The South Bay municipal dischargers consist of three sewage treatment facilities: the San Jose/Santa Clara Water Pollution Control Plant (WPCP), the Palo Alto Regional Water Quality Control Plant, and the Sunnyvale WPCP. These three plants serve all of the urban communities of Santa Clara County located in the region. The South Bay municipal dischargers, as shown in Figure 4-1, presently discharge effluent receiving tertiary treatment (secondary plus nitrification, filtration, and disinfection) to shallow sloughs contiguous with the Bay, south of the Dumbarton Bridge. Therefore, all three dischargers must meet shallow water effluent concentration limits for toxic pollutants.

In 1988, the Regional Board identified the following issues that needed further study in the South Bay. As part of the reissuance of the South Bay NPDES permits, the Regional Board required the three South Bay dischargers to address these issues.

- Identify the sources of metals to the WPCPs;
- Assure the quality of WPCP laboratory measurements;
- Evaluate existing WPCP performance relative to the removal of metals and evaluate the feasibility and cost effectiveness of new processes;
- Initiate laboratory and field investigations relative to establishing site-specific numerical receiving water objectives for copper, nickel, and mercury;
- Monitor conversion of saltwater marshes to freshwater marshes adjacent to the point of discharges;
- Evaluate the City of San Jose and Sunnyvale WPCP sludge lagoons;
- Establish an avian botulism monitoring and control program for the City of Sunnyvale treatment ponds and discharge area in the slough; and
- Evaluate WPCP ammonia removals.

Based on the results of these studies, the Regional Board amended the NPDES permits for the three South Bay dischargers on several occasions.

In 1989, San Francisco Bay south of the Dumbarton Bridge (South Bay) was designated by U.S. EPA as an impaired water body under Section 304(l) of the Clean Water Act due to anthropogenic inputs of seven metals. The three municipal plants and stormwater runoff were designated as sources contributing to the impairment. As of 1994, the wastewater effluents of the three plants routinely exceed the concentration limit for copper and occasionally exceed the limits for other metals, such as nickel. South Bay monitoring data collected by the dischargers from 1989 to 1992 indicate that U.S. EPA water quality criteria for copper, nickel, and mercury are regularly violated in the receiving waters south of the Dumbarton Bridge.

The Basin Plan prohibits the discharge of wastewater to San Francisco Bay south of the Dumbarton Bridge, as well as prohibiting the following:

- Discharge without initial dilution of at least 10 to 1;
- Discharge into any dead-end slough; and
- Discharge of any conservative toxic and deleterious substances above the levels that can be achieved by a program acceptable to the Regional Board.

State Board Order WQ 90-5 (1990) found that a net environmental benefit exception could not be made for the three dischargers. However, the order found that a finding of equivalent protection can be made if water quality-based concentration limits for metals and revised mass loading limits for metals are placed in the dischargers' NPDES permits, if Sunnyvale and San Jose/Santa Clara continue avian botulism control programs, and if San Jose/Santa Clara implements mitigation for loss and degradation of endangered species habitat. Order 90-5 also included provisions that would prevent increases in flows that would adversely impact endangered species habitats.

The Regional Board has amended and reissued permits to the South Bay municipal dischargers to provide equivalent protection. On April 17, 1991, the NPDES permits of the three South Bay Municipal Dischargers were amended to include water quality-based concentration limits and revised mass loading limits for metals, as directed by State Board Order WQ 90-5. Annual avian botulism control program reports are provisions of the Sunnyvale and San Jose/Santa Clara permits.

On September 30, 1991, the City of San Jose proposed the "Action Plan," which was developed to fulfill the endangered species habitat protection requirement. The Action Plan consists of programs for salt marsh conversion mitigation as well as ambitious water conservation and reclamation projects. The Action Plan was accepted by the Regional Board in Resolution 91-152 in lieu of the 120 MGD flow restriction. However, Resolution 91-152 allows for reconsideration of the flow cap if certain conditions of the Action Plan are not met by the discharger. Provisions of the Action Plan are included in the San Jose/Santa Clara NPDES permit as conditions for an exception to the Basin Plan prohibitions.

In 1991, water quality-based permit limits were included in the dischargers' NPDES permits. These new limits were based on continuing concern regarding ambient and discharged levels of copper, nickel, mercury, and other metals. Because the new limits were frequently exceeded, the Regional Board also adopted enforcement orders concurrent with the adoption of revised NPDES permits in 1993. The enforcement orders establish

schedules and a pollution prevention program to achieve compliance with the permit limits for copper, nickel, and cyanide.

The pollution prevention programs specified in the enforcement order were developed through negotiations between Clean South Bay (a coalition of environmental groups) and the dischargers. Board staff and industrial representatives also participated in the negotiations. These programs represent a second phase of implementation of pollution prevention by the three dischargers. Since the first phase of programs was begun in early 1989, the dischargers have reduced their combined discharge of copper mass by approximately 25 percent, and no longer violate effluent limits for silver. The second phase of programs was designed to control the sources of copper and nickel to the treatment plants from industry, commercial establishments, residences, and copper corrosion from water supply pipes.

In the industrial sector, the dischargers will require industrial firms that contribute the majority of copper and nickel to the treatment plants to conduct (or have conducted for them) pollution prevention audits and to identify cost-effective measures for reducing those discharges. Additionally, the enforcement orders require the dischargers to adopt new local discharge limits for commercial and industrial facilities. All three dischargers are also required to continue and expand their existing source control programs in the commercial and residential sectors, which have focused on best management practices and public education. To address contributions of copper from the water supply, the dischargers have worked cooperatively with a steering committee comprised of water distributors, suppliers, and retailers and (1) evaluated alternative corrosion inhibitors to reduce copper corrosion from pipes, and (2) examined the feasibility of eliminating the use of copper sulfate as an algicide in drinking water reservoirs.

The negotiations with the largest of the three dischargers, the San Jose/Santa Clara plant (75 percent of the three combined flows), resulted in landmark funding arrangements for pollution prevention. As part of the settlement agreement with Clean South Bay, the City of San Jose will establish a capital fund of $2 million to assist small businesses with their investment in cost-effective pollution prevention measures identified by the required audits. The city will also pay $375,000 to establish a Pollution Prevention Center, which accounts for any violations of copper, nickel, or silver that may have occurred or may occur between April 17, 1991, and October 20, 1998. The Center will function as an information clearinghouse for best available pollution prevention technologies. These measures will facilitate pollution prevention strategies that will benefit both the economy (cost-effective control strategies) and the environment (reduced mass discharge) in the long term.

The enforcement orders contain compliance schedules for specific mass and concentration limits. The compliance schedules were developed to correspond with the required pollution prevention measures and to provide sufficient time for the measures to be implemented and subsequent reductions in mass and concentration to be realized. As of 1994, effluent data from all three plants continue to show substantial improvements with regard to both mass and concentration of metals discharged. These effluent quality improvements may be related to a combination of successful pollution prevention efforts and innovative experimentation with treatment plant operations. In addition, monitoring results from the 1993 Regional Monitoring Program indicated that ambient water concentrations of mercury and copper in the lower portion of the South Bay did not exceed levels of concern. Water column levels of nickel did exceed the objective at one South Bay station. The Regional Board will continue to assess the long-term trends in ambient levels of metals in this segment of the Bay.

FAIRFIELD-SUISUN SEWER DISTRICT (FSSD)

The FSSD's tertiary wastewater treatment plant has a dry weather treatment capacity of 17.5 million gallons per day (mgd), a wet weather capacity of 40 mgd, and an off-line storage capacity of 45 million gallons. The district is currently treating 13 mgd (1993 dry weather data) from a service population of about 111,000. In order to comply with the Regional Board's prohibition against dry weather discharges to the Suisun Marsh, FSSD operates a reclamation project in cooperation with the Solano Irrigation District. However, due to various contractual, legal and economic constraints, only about 40 percent of the treatment plant's annual effluent flow is reclaimed for agricultural irrigation. The remainder is discharged to Boynton Slough in Suisun Marsh.

The Regional Board required FSSD to conduct an investigation to evaluate the discharge's impact on water quality conditions and beneficial uses of the receiving waters.

This investigation was completed in 1987 and found that the discharge has some measurable local effects on water quality in Boynton Slough, but that beneficial uses are not impaired by the discharge. The study concluded that, overall and on a year-round basis, the discharge affords a net environmental benefit to Boynton Slough and the Suisun Marsh.

Given the findings of this study, the plant's high degree of operational redundancy and emergency storage capacity, and continued efforts by FSSD to maximize the use of reclaimed water, the Regional Board has granted FSSD an exception to the Basin Plan prohibition. The Regional Board allows, through the NPDES permit issued to FSSD, that portion of FSSD's tertiary effluent which cannot be reclaimed to be discharged to Boynton Slough on a year-round basis.

LIVERMORE-AMADOR VALLEY

INTRODUCTION

The primary Regional Board concern in the Livermore-Amador Valley is that an integrated water/wastewater resource operational plan be implemented to protect the main groundwater basin from increased salt (TDS) loading. Existing natural saline sources and basin management practices, with minimal water recycling, result in a net salt loading of approximately 5,000 tons/year.

The Regional Board supports efforts to concurrently improve the salt balance in the main basin, to increase the local water supply, and to reduce the need for wastewater export through recycled water irrigation and groundwater recharge and other basin management practices. In 1993, the Regional Board approved a Master Water Reuse Permit for the water and wastewater agencies in the valley that provides the framework (described below) within which these goals can be accomplished.

A Salt Management Program being developed by the permittees prior to implementation of valleywide recycling projects will provide updated water quality management policies and objectives. The Regional Board will consider permittee requests for future modifications to Basin Plan policies and objectives as appropriate to facilitate implementation of beneficial reuse projects.

BACKGROUND

The Livermore-Amador Valley is a closed groundwater basin within the Alameda Creek Watershed with multiple groundwater subbasins of variable water quality. The main portion of the Main Basin (that portion underlying Livermore and Pleasanton) has the highest water quality, supplies most of the municipal wells in the area, and is used to store and distribute high quality imported water.

Alameda Creek and its tributaries recharge the Livermore-Amador Valley groundwater basin and serve as a channel to convey water released from the South Bay Aqueduct (SBA) to the Niles Cone groundwater basin for recharge. During dry weather, creek flow consists primarily of SBA release water.

The Zone 7 Water Agency is the potable water wholesaler for most of the Livermore-Amador Valley area and operates facilities to import and treat surface water from the State Water Project, groundwater wells, and distribution pipelines. Zone 7 serves as the overall water quality management planning agency for the Alameda Creek Watershed above Niles and is responsible for management of the Valley's surface water and groundwater resources.

Dublin-San Ramon Services District (DSRSD) distributes potable water and treats wastewater in the western portion of the valley, including parts of Contra Costa County. The City of Livermore distributes potable water to about one-fourth of Livermore and treats wastewater from the city and adjacent national laboratories.

Livermore and DSRSD are member agencies of the Livermore-Amador Valley Water Management Agency (LAVWMA). Since 1980, wastewater has been exported from the valley via LAVWMA-operated facilities that connect to an East Bay Dischargers Authority interceptor in San Leandro. These waters are ultimately discharged through the East Bay Dischargers Authority outfall into south San Francisco Bay west of the Oakland Airport.

The current surface water quality objectives for the Alameda Creek Watershed above Niles (Table 3-7) were adopted in 1975. They were set primarily to prevent degradation by wastewater discharge during dry weather periods.

The Table 3-7 groundwater quality objectives and basin boundary definitions for the valley were developed by Zone 7 in its May, 1982, "Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Above Niles." This plan was prepared when wastewater demineralization and reuse were not considered cost-effective in comparison to export; the LAVWMA export project had only recently become operational; the safety of reuse was less widely accepted; and extensive development with on-site systems remained a possibility.

The policies in the 1982 plan consist of a general policy, community wastewater system policies, individual on-site wastewater system policies, and local area policies for known problem areas at that time. The policies were intended to discourage small community wastewater systems and septic tanks in favor of connection to existing large community systems. They also encourage export of wastewater, rather than beneficial reuse via irrigation or groundwater recharge.

Since adoption of the wastewater management plan, Zone 7, DSRSD and Livermore's interest in water recycling has been increased by droughts, continuing scarcity of new water supplies, institutional barriers to increasing wastewater export capacity from the valley, and increasing public acceptance of water recycling throughout California. Technological advances and reduced costs of demineralization also now make groundwater recharge with demineralized wastewater a viable tool for managing salt concentrations in the basin.

WATER RECYCLING FOR VALLEY WATER — WASTEWATER MANAGEMENT

Zone 7 has projected a need for 10,000-25,000 acre-feet per year of additional water supply within the next 10-15 years. Livermore-Amador Valley Water Management Agency wastewater export disposal capacity is currently limited to 21 million gallons per day. This capacity is projected to be exceeded within the next 10-15 years. Wet weather disposal capacity may be exceeded sooner. Additional effluent storage may achieve marginal increases in effective capacity, but will not meet projected disposal demand at buildout.

The water and wastewater agencies of the Livermore-Amador Valley have studied water recycling as an alternative to import of new water supplies and export of wastewater for over 20 years. While LAVWMA continues to investigate export alternatives, the agencies have also developed a strategy for implementing large-scale water recycling.

Valleywide water recycling is consistent with the Regional Board's policy on reclamation, which states in part that disposal of wastewater to inland, estuarine, or coastal waters is not considered a permanent wastewater disposal solution where the potential exists for conservation and reclamation. As directed by Water Code Sections 13511 and 13512, the Regional Board strongly supports the use of recycled water to supplement existing surface and groundwater supplies and will work with agencies to facilitate development of water reclamation facilities.

An important valley water recycling milestone was the City of Livermore's study, "Advanced Treatment and In-Valley Effluent Reuse/Disposal" (October, 1989). The study recommended installing advanced treatment (reverse osmosis demineralization) facilities at the Livermore Water Reclamation Plant to provide recycled water for irrigation and groundwater recharge. The agencies then formed the Tri-Valley Water Recycling Task Force and held several public meetings in 1990 and 1991 to present the findings.

The agencies then jointly sponsored the "Livermore-Amador Valley Water Recycling Study" (May, 1992), a comprehensive investigation of water recycling options. The study documented the area's hydrogeology. It also identified and analyzed potential projects throughout the valley, including irrigation with non-demineralized effluent, groundwater recharge with demineralized effluent, and export of brine. The report included a discussion of how water recycling could be implemented in conformance with Basin Plan requirements and Zone 7 policies.

The report also detailed a strategy for developing a water recycling program incrementally, beginning with small demonstration projects to gain experience and public acceptance and building up to full-scale projects that could contribute substantially to water supply and wastewater disposal needs in future years.

The 1992 study documented that between 19,000 and 38,000 acre-feet per year of recycled water could be beneficially reused within the Livermore-Amador Valley via irrigation and groundwater recharge. Well-established technologies and procedures exist for accomplishing such uses and could be in full compliance with Basin Plan and Title 22 requirements. The long-operating Orange County Water District Water Factory 21 project has served as a model for many recycled water groundwater recharge facilities.

A key element of proposed valleywide water recycling is a salt management program for the groundwater basin. This program includes further characterization of basin hydrogeology, refinement of salt balance calculations, selection of TDS targets, and examination of alternative ways to offset natural salt loadings. (These measures might include wellhead demineralization of pumped groundwater or diversion of natural salt inflows to export facilities.) The Salt Management Program addresses the Basin Plan objectives for the Alameda Creek Watershed that wastewater disposal/reuse projects be part of an "overall water-wastewater resource opera-

tional program developed by the agencies affected and approved by the Regional Board."

MASTER WATER REUSE PERMIT

As recommended in the study, the agencies jointly applied for a master water reuse permit to cover proposed water recycling activities throughout the valley. The permit was issued by the Regional Board in December, 1993 (Order No. 93-159). The permit specifies the various technical reports that are required to be submitted for review and approval by the Executive Officer before projects can commence operation. In this manner, the master permit fully addresses the regulatory requirements that projects must comply with, while facilitating the approval process for individual projects in this long-term, valley-wide program.

This permit identifies two phases and three categories of water recycling projects. During Phase I of the water recycling program, the agencies have proposed first to construct a few small-scale irrigation projects (Group A). This would be followed by startup of a 0.75 MGD demonstration demineralization facility or possibly other salt management projects (Group B). The Phase I projects would be accompanied by a thorough groundwater monitoring program to assess any potential impacts.

As specified in the master permit, during the first three years of small-scale project operation, the agencies would complete the salt management plan, as well as the complex engineering reports, design studies, and other documentation the Executive Officer will require before approval of any Phase II full-scale, valleywide irrigation and groundwater recharge projects (Group C). Within five years of start-up of the first new small-scale (Phase I) project, the salt management plan would be implemented to achieve 100 percent mitigation of impacts on groundwater quality from water recycling activities.

The salt management plan will be developed beginning in 1995 based on the concept that the effect of each individual project on the main basin groundwater resource is best assessed in the context of the cumulative effects of all such projects, as well as the effects of groundwater management policies and natural conditions. The relative geological homogeneity of the Main Basin lends itself to a mass-balance approach for assessing cumulative impacts. For a planning horizon of ten years, the salt management plan will define a project or set of projects that will:

- Fully mitigate the effects of salt loading due to water recycling on the main basin groundwater resource;
- Minimize the current trend toward increasing main basin groundwater salinity due to subsurface groundwater inflow or natural recharge;
- Ensure that water imports and water recycling will not contribute to the degradation of groundwater quality; and
- Protect groundwater beneficial uses.

The salt management plan will also provide a technical basis for estimating and allocating salt loading or removal among existing sources and new projects. Accordingly, the plan includes development of a basinwide model of salt sources and sinks. Numerical factors representing, for example, connectivity between groundwater basins and effects of filtering through the soil mantle, will be estimated using the preparer's best professional judgement. The plan will also provide information needed to support the DHS engineering report for full-scale groundwater recharge projects.

Groundwater recharge or conveyance via ephemeral streams or waters of the state is an essential component of the proposed valley-wide, year-round water recycling and groundwater quality management program. Projects subject to NPDES requirements are not authorized under the master water reuse permit. The permit solely identifies the technical reports necessary to support a future NPDES permit application. The Regional Board will consider issuing a separate NPDES permit to the permittees following receipt of a complete NPDES application.

IMPLEMENTATION POLICIES

The Regional Board supports the concept that water recycling is an essential component for planning the valley's future water supply. Water recycling is particularly important in areas that are dependent on imported water, such as the valley.

The Regional Board supports managing the basinwide salt balance through an integrated water-wastewater resource operational plan. Such a plan should combine management of the groundwater basin, water conservation, salt management projects, and water recycling, with and without demineralization.

The Regional Board supports the concept of transport and recharge through the valley's ephemeral streams. Recharge of the groundwater basin may be accomplished with

imported water, as is done now, or with high-quality recycled water under a future NPDES permit. The year-round, dependable recycled water resource may be appropriate for streamflow augmentation to enhance beneficial uses of the valley's ephemeral streams.

EAST BAY MUNICIPAL UTILITY DISTRICT (EBMUD) AND LOCAL AGENCIES

The sewer systems of the seven local agencies in the East Bay communities (Alameda, Albany, Berkeley, Emeryville, Oakland, Piedmont, and Stege Sanitary District) have had a serious problem with infiltration/inflow (I/I) during the wet weather season. During major storms, the communites' sewers receive up to 20 times more flow than in dry weather. As a result, the communities' sewers overflowed to streets, local watercourses, and the Bay, creating a risk to public health and impairing water quality. The seven local agencies deliver sewage to EBMUD's facilities, and thus, EBMUD's interceptors and treatment facilities are also subject to overflows during storm events.

The Regional Board approved a regional approach—a combination of community collection system improvements and EBMUD capacity improvements—for correcting wet weather overflows. Following the Basin Plan, EBMUD and the agencies established the following priorities to correct this problem:

- Substantially reduce or eliminate community sewer overflows with high public health risks;
- Substantially reduce or eliminate other community sewer overflows; and
- Eliminate or mitigate interceptor overflows.

In 1985, the East Bay communities completed a multi-year infiltration/inflow (I/I) study, which proposed a $300 million (1985 dollars) comprehensive sewer rehabilitation and relief line program known as the East Bay Infiltration/Inflow Correction Program (ICP); it required 20 years to implement. In a 1986 enforcement order, the Regional Board accepted the proposed approach and directed the ICP to focus on high public health problems.

In 1986, all agencies submitted Compliance Plans in response to the cease-and-desist orders issued by the Regional Board. These plans set forth the design and implementation requirements of each agency's I/I Correction Program.

EBMUD's and the collection system agencies' programs are designed to handle wastewater and I/I flows for up to a five-year wet weather event. For rainfall events that have a return frequency greater than five years, overflows from the sanitary collection and treatment systems may occur. This approach is consistent with the Basin Plan wet weather overflow requirements (Maintenance Level C) adopted for the I/I Correction and the Wet Weather Facilities Program.

The communities have made good progress implementing their ICP, eliminating about 60 percent of the high public health risk overflows. They have also gained a better understanding of how to implement their ICP. This experience has revealed that some of the original planning assumptions underestimated sewer rehabilitation and replacement costs. As a result, the communities revised their programs, and the Cities of Alameda, Albany, Berkeley, Oakland, and Piedmont requested extensions to their compliance schedules by five to ten years. In 1993, the Regional Board amended its enforcement order giving extensions to some communities' compliance schedules. The amended enforcement order also contains revised compliance reporting requirements.

As part of the regional approach, EBMUD's contribution is a $145 million (1985 dollars) Wet Weather Program designed to increase treatment capacity to match the communities' flows. The Wet Weather Program includes an expansion of the main wastewater treatment plant, new storage basins, four new remote wet weather treatment plants, new and upgraded pumping stations, and 7.5 miles of new interceptors. This program will increase EBMUD's peak transport and treatment capacity, without which community sewers would continue to overflow. It will also provide treatment for wet weather discharges and meet or exceed Basin Plan requirements.

As of 1995, EBMUD has completed the expansion of the main wastewater treatment plant, all interceptor improvements, construction of the main plant storage basin, and construction of the two principal wet weather treatment facilities (Oakport and Point Isabel). The work remaining includes two pump station improvements, a storage basin, and two wet weather treatment plants. The Wet Weather Program is scheduled for completion in 1998.

INDUSTRIAL FACILITIES

This section discusses industrial waste discharges to surface waters under the NPDES program. Other industrial waste disposal practices are discussed in a later section entitled "Hazardous and Nonhazardous Waste Disposal" under Groundwater Protection and Management.

The Regional Board has permitted over 320 industrial discharges in the region. They can be separated into two general types: process-related wastewaters and groundwater from clean-up activities. There are about 50 discharges of process wastewater; of these, 15 are classified as major discharges, and the rest are mostly small discharges of non-contact cooling water and/or runoff. About 270 of the 320 discharges consist solely of treated groundwater from remediation activities at solvent and/or fuel contamination sites. These are minor in flow relative to the major discharges and are discussed in more detail in an earlier section entitled "Discharge of Treated Groundwater." Additionally, there are over 1,500 industrial facilities discharging only stormwater runoff. The regulation of these discharges is discussed in a later section entitled "Urban Runoff Management."

The 15 major discharges are the most significant individual sources of pollutant loadings from industrial discharges. They are identified and described in Table 4-10, and their locations are shown in Figure 4-2. These industries have all installed treatment facilities that can be considered to provide "best available treatment economically achievable" (BAT) and are in compliance with available BAT standards promulgated by U.S. EPA for each industrial classification.

The Regional Board's goal for regulation of industrial discharges is to continue to move beyond treatment technology-based standards to water quality-based standards. With this shift, the industries are challenged to improve existing or develop new treatment and control technologies to achieve higher levels of protection of receiving waters' beneficial uses.

The effect of the Regional Board's regulation has been to drastically reduce the pollutant loadings from industrial sources. But with the focus shifting to water quality-based standards, concerns still do exist in certain areas. For example, a major concern is discharge of selenium from oil refineries. Water quality data from the Regional Monitoring Program and other studies will be necessary to identify areas of most concern and help target future pollutant reduction efforts.

PRETREATMENT AND POLLUTION PREVENTION

The Waste Discharge Permitting Program described above focuses on limiting pollutant discharge to the Bay from industrial and municipal treatment systems. In most situations, however, the overall effectiveness of treatment depends on the type and amount of pollutants that enter these POTW or industrial treatment systems. Some pollutants may cause upset to or interference with the operation of the treatment plant, sludge contamination, or harm to treatment plant workers and the public if discharged into sewer systems. In general, it is often more economical to reduce overall pollutant loading into treatment systems than to install complex and expensive technology at the plant.

The goal of pretreatment is to protect treatment plants, worker health and safety, and the environment from the impact of discharges of certain toxic wastes (e.g., explosive and corrosive materials) into sewer systems.

The goals of pollution prevention expand beyond the original pretreatment goals and are to:

(A) Generally support reducing all pollutant discharges into sewer systems through more efficient use of chemicals and water conservation, recycling, reuse, and waste reduction; and

(B) Identify sources and reduce overall discharge of specific pollutants that have been found to impact or threaten beneficial uses.

CALIFORNIA PRETREATMENT PROGRAM

Each POTW regulates the types of waste discharged into sewer systems leading to its treatment plant. General standards for discharge to POTWs are set by U.S. EPA for certain types of waste and industrial categories. Each POTW receiving a large amount of industrial waste and/or with a design flow greater than 5 million gallons per day (MGD) is required to develop and implement a pretreatment program, including enforcing its own local discharge limits. The goal is to both protect treatment plants and ensure that the POTW is in compliance with its own discharge permit.

The Regional Board oversees the implementation of the California Pretreatment Program under the California Water Code and federal Clean Water Act, although U.S. EPA retains

its oversight role and is still actively involved in inspections and enforcement activities. POTW pretreatment programs must include components as specified in federal regulations and program descriptions incorporated into the NPDES permit for each POTW.

Specific monitoring and reporting requirements for the 27 POTWs in the San Francisco Bay region with approved pretreatment programs are contained in one "blanket" NPDES Permit Amendment. This blanket amendment was first issued by the Regional Board in 1980, and later revised in 1984, 1989, and 1995. Major budgeted program tasks for the Regional Board's oversight activities include pretreatment compliance inspections and audits; annual and semiannual report reviews; program modifications, particularly local limits revisions; and enforcement activities.

POLLUTION PREVENTION

POLICY STATEMENT

The Regional Board supports reducing toxic discharges through more efficient use, conservation, recycling, reuse, and waste reduction. The pollution prevention program is designed to eliminate or minimize the discharge of toxic wastes into waters of the region. The program emphasizes pollutant source reduction "upstream" of treatment plants and techniques such as material recycling, reuse, conservation, material substitution, product substitution, and process modifications. In addition, the program also supports increased water recycling and reuse, wastewater treatment prior to discharge into sewers, and expansion of the Pretreatment Program. This general approach to minimizing waste discharge is a necessary element in the implementation of the State Board's Mass Emission Strategy and will become increasingly important as alternative uses of wastewater are developed.

The Regional Board's Waste Minimization Program is a two-tiered program. The first tier is a general program, focused on long-term pollution prevention and overall reduction of toxics entering sewer systems. The general program is structured to allow each POTW to develop and direct pollution prevention efforts in its own service area. It also allows POTWs to reduce toxic pollutant loading to their plants and remain in compliance with their discharge permits.

The second tier is a more involved, or targeted, program aimed at ameliorating existing water quality problems. The goal of targeted programs is to reduce the total amount of a specific pollutant (or pollutants) discharged to specific water bodies. Targeted programs are required when numeric or narrative water quality objectives are exceeded and beneficial uses are impaired or threatened. Both programs will take multimedia concerns into account by coordinating with other relevant regulatory programs related to air and land disposal.

All POTWs with an approved pretreatment program and all major industrial dischargers that are not required to implement a targeted program are required to develop and implement a general pollution prevention program within their jurisdiction.

When the Pollution Prevention Program was initiated, the largest dischargers (all POTWs with an average dry weather discharge over 10 MGD and all major industrials) were required to prepare and submit for Regional Board approval an initial plan for general pollution prevention by July 1, 1992. Smaller POTWs were placed on a slightly longer schedule and required to submit plans by January 1, 1993. Dischargers submit mid-year progress reports and a comprehensive annual report discussing progress and accomplishments with respect to the elements outlined below, possible program changes, and future program developments.

GENERAL POLLUTION PREVENTION PROGRAMS

The general program is designed to allow individual POTWs to develop and direct long-term waste minimization efforts according to local needs and is more flexible than targeted programs. General programs should contain the following elements:

(a) Pretreatment program review and enhancement.

This should include a general review of opportunities for incorporating waste-reduction goals into inspections, enforcement, and permitting (such as increased inspection, improved process flow measurements, etc.) In addition, previously unregulated types of industrial and commercial facilities that discharge pollutants of concern to the POTW should be identified. Each general program should include provisions for two additional categories of discharge that are not covered under the federal regulations (such as waste oil disposal, household products, car and truck washing operations, medical and dental facilities, etc.).

(b) Waste minimization audits.

Prioritize need for and conduct audits of industrial users. The criteria for prioritization should include discharge of pollutants of concern, volume of flow, industrial-user compliance, and opportunities for waste reduction.

(c) Public outreach.

Design and conduct public education programs aimed at publicizing appropriate household waste management, including advertising campaigns and household hazardous waste programs.

(d) Coordination with other programs involving recycling, reuse, and source reduction of toxic chemicals, such as air, hazardous waste, and land disposal.

This might include developing programs for joint inspections and sharing in enforcement activities.

(e) A monitoring program specifically designed to measure the effectiveness of waste minimization activities in reducing toxic loads to the receiving watershed, air, or land via sludge disposal.

TARGETED POLLUTION PREVENTION PROGRAMS

The purpose of targeted pollution prevention programs is to reduce the total amount of specific toxic pollutants being discharged to POTWs through source reduction and recycling. Targeted programs are more intensive versions of the general programs and are focused only on one or a select number of pollutants.

In those areas of the watershed or estuary system identified as exceeding water quality objectives or having impaired beneficial uses, dischargers that are significant contributors to the water quality problem will be identified and required to participate in a targeted waste minimization program.

NPDES permits for each identified POTW will be amended by the Regional Board to require the development and implementation of appropriate pollution prevention measures within a given time schedule.

The first phase of a targeted pollution prevention program involves quantifying the amount of the pollutants in question being discharged to the POTW from (a) regulated industrial users, (b) commercial facilities, (c) water supplies, and (d) domestic sewage.

It may also be necessary to conduct further monitoring of pollutants of concern in water, sediment, and biota by identified dischargers to POTW systems and/or POTWs at and near their discharge locations in order to more precisely determine associated effects.

The second phase of the targeted program is to initiate reductions in pollutant loading, focusing on the most effective and economically feasible control measures first. These reductions may be achievable through focused public outreach, technical information transfer regarding effective management techniques, or installation of appropriate technologies.

The targeted program shall include all elements of the general program, expanding where appropriate to maximize the reduction of the targeted pollutants.

Targeted programs may also require other options, such as performance-based effluent concentration limits and mass limitations for the pollutants of concern, in order to attain water quality objectives in the receiving water body. Phased implementation of the program will be carried out in coordination with the development and implementation of other tasks under the Mass Emissions Strategy required in the State Board's Pollutant Policy Document.

DIRECT INDUSTRIAL DISCHARGER POLLUTION PREVENTION PROGRAM

Industrial entities discharging directly to receiving waters instead of public sewer systems are also subject to similar pollution prevention requirements. Overall source reduction and recycling of hazardous wastes, including audits, planning, and reporting to the Department of Toxic Substance Control, are required under the Hazardous Waste Source Reduction and Management Review Act of 1989 (CCR Title 22, Ch 31). Rather than require separate pollution prevention programs, these dischargers will be asked to submit copies of the required pollution prevention reports (those sections specifically addressing liquid waste and reduction of pollutants discharged to water) to the Regional Board. Initial plans for pollution prevention, including detailed descriptions of tasks and schedules, were submitted by these dischargers in 1992.

In the event that existing pollution prevention reports do not adequately address reduction of toxic pollutants in effluent, the Regional Board will require additional information.

In cases where water quality problems exist or where beneficial uses are impaired or threatened by direct industrial dischargers, focused pollution prevention programs similar to POTW targeted programs will also be required. In cases where staff feel that independent audits (as opposed to audits conducted by involved companies) are justified, the issue will be brought before the Regional Board. The effort should result in the reduction or elimination of specific pollutants of concern.

SURFACE WATER PROTECTION AND MANAGEMENT—NONPOINT SOURCE CONTROL

During periods of wet weather, rain carries pollutants and sediment from all parts of the watershed into streams and the larger Estuary. These diffuse sources of pollutants range from parking lots and bare earth at construction sites to mining sites and farm enclosures. In addition to runoff from land, there are diffuse pollutant sources associated with maritime activity, such as dredging, wastes from vessels, and accidents such as oil spills.

The total amount of pollutants entering aquatic systems from these diffuse, nonpoint sources is now generally considered to be greater than that from any other source. Protecting the region's aquatic systems from impacts associated with these diffuse sources is a long-term challenge and requires very different approaches than the control of pollutants from point sources.

Nonpoint source pollution management involves three basic elements: (1) changes in existing operating practices to minimize the potential for untreated wastes to reach aquatic systems; (2) collection and treatment of wastes; and (3) prohibition of waste-generating practices. The degree of changes required to control or eliminate nonpoint source pollution depends on several factors, including the magnitude of the pollution problem and the sensitivity of exposed aquatic systems.

In order to identify and apply the most effective and economically efficient control measures, thorough investigations relating receiving water conditions to specific nonpoint sources are necessary. In many cases, however, specific water quality problems are already known to be generally linked to nonpoint source pollution, but sufficient information is not available to pinpoint the exact cause-and-effect relationship. Thus, the first step in nonpoint source management is often to conduct these investigations and refine control plans as information becomes available. Concurrently, general improvements may be gained from "good practice" techniques.

The Regional Board's nonpoint source control programs are designed around very specific sets of problems, each of which involves a unique set of institutions and technical issues. This section describes each separate program.

URBAN RUNOFF MANAGEMENT

During periods of rain, water flushes sediment and pollutants from urbanized parts of the Estuary (Figure 4-3) into storm drain systems. These drains discharge directly to surface waters within the region, except in San Francisco, where stormwater is mixed with sewage and directed to the treatment plant.

Urban runoff contributes significant quantities of total suspended solids, heavy metals, petroleum hydrocarbons, and other pollutants to the waters of the region. The impacts of pollutants in urban runoff on aquatic systems are many and varied. For example, small soil particles washed into streams can smother spawning grounds and marsh habitat. Lead and petroleum hydrocarbons washed off from roadways and parking lots may cause toxic responses in aquatic life and represent another kind of threat. The U.S. EPA found levels of cadmium, copper, lead, and zinc in urban runoff exceeded freshwater acute aquatic life criteria in 9 to 50 percent of samples taken across the country. The chronic criteria for these metals, and for beryllium, cyanide, mercury, and silver were exceeded in at least 10 percent of the samples. In the San Francisco Bay region, the Association of Bay Area Governments (ABAG) has found consistently high levels of hydrocarbons in urban runoff.

The Regional Board's urban runoff management program focuses on reducing pollutant transport through stormwater drain systems into surface waters. In general, measures that will effectively limit storm drain pollutant discharge will also limit direct runoff of pollutants into creeks, streams, and lakes.

The program is structured around the municipalities and local agencies responsible for maintaining storm drain systems and three classes of activities that are responsible for

significant amounts of pollutant influx to those public storm drain systems: highways under the jurisdiction of the California Department of Transportation (Caltrans), industrial activities, and construction on areas larger than 5 acres.

Within each of these program areas, the Regional Board's urban runoff management approach emphasizes general, long-term planning to avoid any increases in pollutant loading and more structured, intensive approaches when existing water quality problems require immediate action.

A large part of the Regional Board's work in managing urban runoff involves supporting local planning and investigation. The program includes:

- Organizing local ad hoc task forces within each hydrologic sub-region (see maps in Chapter 2) to facilitate investigations and design of appropriate control strategies. These task forces include representatives from local government, point source dischargers, local industries, the Regional Board, and U.S. EPA.
- Developing cooperative investigation and control strategies utilizing the expertise and resources of point source dischargers in each of the receiving water segments.
- Supporting research by the San Francisco Estuary Institute, ABAG, U.S. EPA, and other entities to better define the impacts of urban runoff discharges.
- Participating on the State Board Stormwater Quality Task Force and in the development and implementation of a statewide urban stormwater best management practices manual.
- Working with other agencies, such as the Bay Area Air Quality Management District and the Metropolitan Transportation Commission, to ensure that transportation-related strategies and plans will reduce the impact on receiving waters from transportation system runoff discharges.

MANAGEMENT OF POLLUTANT DISCHARGE FROM STORM DRAINS

The Regional Board's strategy for managing pollutants and sediment in urban runoff entering and being discharged from public storm drain systems is two-tiered. All cities and counties are encouraged to develop and implement voluntary programs aimed at pollution prevention throughout the region (Baseline Control Program). Selected cites and counties, by virtue of the amount of pollutants being discharged from their storm drain systems, impact of those discharges on receiving waters, or population, are required to develop pollution prevention programs and take steps to reduce runoff into drain systems (Comprehensive Control Program).

The first major step in addressing pollutant loading to public storm drains was to compile basic information on existing systems. Local agencies owning or responsible for storm drain systems and flood control agencies surveyed by the Regional Board had limited and often dated information on the storm drain systems that they own or manage. In addition, flow and water quality data for storm drain system discharges were virtually nonexistent. The survey also found that current management of storm drain systems is primarily focused on flood control, with storm drainage inlets, lines, and catch basins scheduled for cleaning annually or on an as-needed basis for flood prevention purposes.

BASELINE CONTROL PROGRAM

All local agencies, including special districts, in the cities and counties in the region (see Table 4-11) that own or have maintenance responsibility for storm drain systems should develop and implement a baseline control program.

The goal of the baseline control programs is to prevent any increase in pollutants entering these systems. To a large extent, this goal can be achieved by including consideration of pollutant runoff into storm drain systems in the course of local planning efforts and encouraging "good practice" techniques.

Components of baseline control programs should include review and update of operation and maintenance programs for storm drain systems; development and adoption of ordinances or other planning procedures (such as CEQA review) to avoid and control pollutant and sediment loading to runoff as part of the normal design and construction of new and significant redevelopment (both during construction and after construction is completed); and education measures to inform the public, commercial entities, and industries on the proper use and disposal of materials and waste and correct practices of urban runoff control. Baseline control programs should also include surveillance, monitoring, and enforcement activities to ensure and document implementation.

Similarly, flood control agencies should consider the impact of their projects on receiving waters. Flood management projects,

facilities, or operations should be designed, operated, and maintained to reduce the amount of pollutants in stormwater discharges as well as to achieve flood control objectives.

The Regional Board will support and encourage the development and implementation of baseline control programs in cooperation with cities and counties. Regional Board staff may provide technical guidance and support, facilitate ad hoc working groups including people with expertise and experience in POTW pollution prevention programs and local hazardous waste management, and participate in development of model ordinances.

The programs should be coordinated with POTW and industrial pollution prevention programs and local hazardous materials management programs.

In addition, the Regional Board will focus its surveillance, monitoring, and enforcement activities and review Environmental Impact Reports on new development and significant redevelopment for implementation of effective baseline control programs. The effectiveness of a municipality's baseline control program will also be considered when issuing NPDES permits for construction activities pursuant to the Regional Board's Construction Activity Control Program.

The Regional Board requires the local agencies, special districts, and municipalities listed in Table 4-12 to submit annual reports (pursuant to Section 13225(c) of the California Water Code) describing their baseline control programs. These reports are due on September 1 of each year and should describe:

- Operation and maintenance activities associated with the storm drain systems;
- Master planning procedures and documentation of activities associated with control of pollutants entering storm drain systems;
- A list of all new development and significant redevelopment projects with documentation that urban runoff control measures have been required and are being implemented;
- Documentation of educational measures;
- Documentation of surveillance, monitoring, and enforcement activities; and
- A qualitative evaluation of program effectiveness, including, but not limited to, program accomplishments, funds expended, staff hours utilized, an overall evaluation, and plans for the upcoming year.

To the extent that voluntary implementation of baseline control programs is not realized, the Regional Board will act, where necessary, to require individual local agencies to investigate specific runoff discharges, quantify pollutant loads, and identify and implement control strategies for pollutant runoff into storm drains. Where necessary, the Regional Board requires individual local agencies to file a Report of Waste Discharge or NPDES permit application for the implementation of baseline control programs.

Cities and counties should review and revise their planning procedures and develop or revise comprehensive master plans to assure that increases in pollutant loading associated with newly developed and significantly redeveloped areas are, to the maximum extent practicable, limited. Areas that are in the process of development or redevelopment offer the greatest potential for utilizing the full range of structural and non-structural control measures to limit increases in pollutant loads. Comprehensive planning must be used to incorporate these measures in the process of developing. Cities and counties should fully utilize their authority under CEQA to assure implementation of control measures at all proposed development and significant redevelopment projects.

COMPREHENSIVE CONTROL PROGRAM

The goal of the Regional Board's comprehensive control program is to remediate existing water quality problems and prevent new problems associated with urban runoff. To achieve this, the program focuses on reducing current levels of pollutant loading to storm drains to the maximum extent practicable. The Regional Board's comprehensive program is designed to be consistent with federal regulations (40 CFR 122-124) and is implemented by issuing NPDES permits to owners and operators of large storm drain systems and systems discharging significant amounts of pollutants. The conditions of each NPDES stormwater permit require that entities responsible for the systems develop and implement comprehensive control programs.

The regulations authorize the issuance of systemwide or jurisdictionwide permits, and they effectively prohibit non-stormwater discharges to storm drains. They also require listed municipalities to implement control measures to reduce pollutants in urban stormwater runoff discharges to the maximum extent practicable. The Regional Board will, where necessary, require stormwater discharge permits for discharges not cited in the

regulations that are a significant contributor of pollutants to waters of the region.

The comprehensive urban runoff control program includes all elements of the baseline control program designed to prevent increases in pollutant loading. To reduce current pollutant loading to the maximum extent practicable, the program also includes:

- Characterization of urban runoff discharges to the extent necessary to support program development;
- Elimination of illicit connections and illegal dumping into storm drains;
- Development and implementation of measures to reduce pollutant runoff associated with the application of pesticides, herbicides, and fertilizer;
- Development and implementation of measures to operate and maintain public highways in a manner that reduces pollutants in runoff; and
- Effective pollution reduction measures that may include educational activities such as painting signs on storm drain inlets and regulation of activities such as application of pesticides in public right-of-ways.

Each NPDES stormwater permit issued by the Regional Board will require an annual report evaluating the effectiveness of its comprehensive urban runoff control program. At a minimum, quantitative monitoring, a detailed accounting of program accomplishments (including funds expended and staff hours utilized), an overall evaluation of the program, and plans and schedules for the upcoming year shall be used to assess effectiveness.

The Regional Board's urban runoff control program is still relatively new. Table 4-11 lists the entities in each area that have implemented comprehensive control programs. In addition, there is a need to develop and implement similar programs in the urban and rapidly developing areas of Solano County and the cities of San Rafael, Novato, Petaluma, Napa, and Benicia, and the Ports of Oakland, Richmond, and San Francisco. Urban runoff discharges from these areas are considered significant sources of pollutants to waters of the region and may be causing or threatening to cause violations of water quality objectives. The Regional Board intends to consider similar action for these at a later time. The City and County of San Francisco is not permitted under the stormwater program because it has a combined (sanitary and storm) sewer system operating in accordance with existing NPDES permits.

The Regional Board will conduct surveillance activities and provide overall direction to verify and oversee implementation of urban runoff control programs. Technical guidance for prevention activities, the identification, assignment, and implementation of control measures, and monitoring will be developed.

HIGHWAY RUNOFF CONTROL PROGRAM

An essential component of reducing pollutant loading to storm drain systems involves managing runoff from public roads. While many roads fall under the jurisdiction of entities responsible for storm drain systems, public highways are controlled by the California Department of Transportation (Caltrans). In order to ensure that all public highways are maintained to reduce pollutant runoff, the Regional Board issued a stormwater NPDES permit to Caltrans in August, 1994. The permit requires implementation of a highway Stormwater Management Plan that addresses the design, construction, and maintenance of highway facilities relative to reducing pollutant runoff discharges to the maximum extent practicable.

The highway runoff management plan shall include litter control, management of pesticide/herbicide use, reducing direct discharges, reducing runoff velocity, grassed channels, curb elimination, catch basin maintenance, appropriate street cleaning, establishing and maintaining vegetation, infiltration practices, and detention/retention practices. In addition, the plan must include monitoring the effectiveness of control measures, runoff water quality, and pollutant loads. When possible, Caltrans is expected to coordinate with existing agencies and programs related to the reduction of pollutants in highway runoff.

INDUSTRIAL ACTIVITY CONTROL PROGRAM

Industrial stormwater sources are subject to best available technology (BAT) economically-based standards. Federal regulations require stormwater permits for any site where industrial activity takes place (or has in the past) and materials are exposed to stormwater. The definitions of industrial activities subject to these permits (provisions of Title 40, Code of Federal Regulation, Part 122.26, revised December 18, 1992) are incorporated by reference into this plan. This incorporation by reference is prospective, including future changes as they take effect. The Regional Board will require an NPDES permit for the

discharge of stormwater from all industrial facilities where such activities occur. These permits apply to the discharge from any system used to collect and convey stormwater at industrial sites. These sites include, but are not limited to, industrial plant yards, access roads and rail lines, material and refuse handling areas, storage areas (including tank farms), and areas where significant amounts of materials remain from past activity. Permits are issued both to privately and publicly (federal, state, and municipal) owned facilities.

The Regional Board's permitting strategy for industrial facilities is based on a four-tier set of priorities for issuing permits. At a minimum, all permits will require compliance with all local agency requirements. General permits for industrial facilities will not be less stringent than individual permits.

TIER I: GENERAL PERMITTING

The majority of stormwater discharges associated with industrial activity in the region will be covered under a general permit issued by the State Board in November, 1991.

TIER II: SPECIFIC WATERSHED PERMITTING

In some watersheds, water quality has been impacted by stormwater discharges from facilities associated with industrial activity. Facilities within these watersheds will be targeted for individual stormwater permits or regulation under watershed-specific general permits. The Regional Board issued a general permit for industrial activity in the portion of Santa Clara County that drains to South San Francisco Bay to support the county's comprehensive control program and will consider a similar general permit for Alameda County at a later time.

TIER III: INDUSTRY-SPECIFIC PERMITTING

Specific industrial categories will be targeted for individual or industry-specific general permits. For example, the Regional Board issued a general permit for stormwater discharges from boatyards in August, 1992. The use of general permits is intended to alleviate the administrative burden of issuing stormwater permits for individual industrial facilities. In some cases, such as large U.S. Department of Defense facilities, individual sites or classes of sites may be significant sources of pollutants, and general permit(s) specific to these classes of sites are warranted

The Regional Board considers stormwater discharges from automotive operations, including gas stations, auto repair shops, auto body shops, dealerships, and mobile fleet-washing businesses, to be significant sources of pollutants to waters in the region. Local agencies implementing comprehensive control programs are addressing these discharges through ordinances as part of their comprehensive control programs. The effectiveness of local measures will be assessed before the Regional Board considers permitting these under a separate industrial permit.

TIER IV: FACILITY-SPECIFIC PERMITTING

A variety of factors will be used to target specific facilities for individual permits, such as amount and characteristics of runoff, size of facility, and contribution to existing water quality problems. Permitted individual facilities will be required to identify "hot areas" where runoff may contact pollutants, or activities that may release pollutants to runoff; segregate stormwater discharges from the "hot areas;" and identify and implement control measures for "hot areas." In addition, permittees will be required to eliminate all non-stormwater discharges to storm drain systems unless authorized by a NPDES permit or determined not to be a source of pollutants requiring an NPDES permit.

CONSTRUCTION ACTIVITY CONTROL PROGRAM

The Regional Board will require an NPDES permit for the discharge of stormwater from construction activities involving disturbance of five acres or greater total land area or that are part of a larger common plan of development that disturbs greater than five acres of total land area. The majority of construction activity discharges in the region will be permitted under a general permit issued by the State Board in 1992. Permit conditions address pollutant and waste discharges occurring during construction activities and the discharge of pollutants in runoff after construction is completed. Permit conditions are consistent with the Regional Board's erosion and sediment control policy (Resolution No. 80-5) and consistent with local agency ordinance and regulatory programs. The intent of the permit is not to supersede local programs, but rather to complement local requirements. This will require local agencies to effectively address construction activities through their early planning, CEQA processes, and implementation of development control measures as part of their baseline or comprehensive control programs.

AGRICULTURAL WASTEWATER MANAGEMENT

Agricultural wastewaters and the effect of agricultural operations must be considered in terms of land-use practices and controls developed in the agricultural element of land-use plans. The activities of primary importance to water quality in this basin are animal confinement and irrigation practices. Agricultural pesticide use and limits on fertilizer application are not specifically considered because of the limited applicability in this region.

ANIMAL CONFINEMENT OPERATIONS

Animal confinement operations, such as kennels, horse stables, poultry ranches, and dairies, raise or shelter animals in high densities. Wastes from such facilities can contain significant amounts of pathogens, oxygen-depleting organic matter, nitrogen compounds, and other suspended and dissolved solids. In addition, erosion is also a common problem associated with these facilities. Runoff of storm or wash water can carry waste and sediment and degrade receiving surface waters. Groundwaters can also be degraded when water containing these wastes percolates into aquifers. The risk of water quality degradation increases during the rainy season when animal waste containment and treatment ponds are often overloaded.

Minimum design and management standards for the protection of water quality from confined animal operations are promulgated in Title 23, California Code of Regulations, Chapter 15, Article 6. These regulations prohibit the discharge of facility washwater, animal wastes, and stormwater runoff from animal confinement areas into waters of the state. They also specify minimum design and waste management standards, including:

- Collection of all wastewaters;
- Retention of water within manured areas during a 25-year, 24-hour storm;
- Use of paving or impermeable soils in manure storage areas; and
- Application of manures and wastewaters on land at reasonable rates.

The Regional Board has the authority to enforce these regulations through Waste Discharge Requirements.

Facilities such as the dairies located in Marin and Sonoma counties and horse boarding stables are typical of animal confinement operations within the region.

DAIRY WASTE MANAGEMENT

Much of the land within the Tomales Bay, Petaluma River, Napa, and Sonoma Valley watersheds is used for agricultural purposes. Within these watersheds, a significant number of livestock are housed and grazed.

Animal waste can cause water quality problems through runoff into surface waters and groundwaters of the state. Stockpiled manure, washwater, and stormwater runoff from corrals, pens, and other animal confinement areas are potential sources of water pollution due to their high bacteria levels (the coliform group used as indicators), ammonia, nitrate, and suspended solids. Detergents, disinfectants, and other commonly used biocides may also contribute to the toxicity of animal wastes. These constituents can be extremely deleterious to fish and other forms of aquatic life. High bacterial levels have had an adverse impact on shellfish resources in the region (e.g., commercial shellfish harvesting in Tomales Bay).

Problems facing the dairy industry include manure containment during the rainy season, appropriate manure dispersal on pasture land, and implementation of range-management practices aimed at water quality protection. The availability of ample farm and pasture land is therefore extremely important in managing animal waste.

Since the 1970s, the cooperative relationship between the Regional Board and the dairy industry has been an important aspect of dairy waste control. That relationship has been instrumental in the construction of dairy waste handling, treatment, and disposal facilities in the late 1970s. However, proper waste control management is just as important as the physical facility. Management techniques include routing washwater and drainage to impervious holding and storage areas, constructing manure storage areas controlling both subsurface infiltration and runoff, stormwater overflow protection for retention basins, and applying manures and wastewater on land at reasonable rates for maximum plant uptake of nitrogen.

Poor practices that have led to water quality problems in the past include inadequate maintenance and operation of facilities; overloading treatment and storage facilities; increasing herd size without commensurate additions to waste handling facilities; poor range manage-

ment practices; and simple neglect of seasonal waste management responsibilities.

DAIRY WASTE REGULATION

Both the regulation and the support services for the dairy industry involve several federal, state, and local agencies. Each has its particular role and mission, but all share the goal of protecting the beneficial uses of state waters while assisting dairies in complying with regulations while conducting their day-to-day business. The following agencies play a direct role in dairy waste management and regulation:

REGULATORY

- California Regional Water Quality Control Board
- California Department of Fish and Game

SUPPORT SERVICES

- Agricultural Stabilization and Conservation Services
- U.S. Department of Agriculture — Soil Conservation Service
- University of California Cooperative Extension Farm Advisor
- County Farm Bureaus
- Resource Conservation Districts

To address dairy waste management concerns, dairy operators in Marin and Sonoma counties have formed a Dairy Waste Committee. The Dairy Waste Committee supports dairy operators in their efforts to solve waste control problems and locate technical and financial assistance. The committee serves as a vehicle through which the Regional Boards and California Department of Fish and Game can disseminate information on water quality regulations and requirements. This committee does and will continue to play an important role in any successful waste control program.

Additionally, the Southern Sonoma and Marin County Resource Conservation Districts (RCDs) have a cooperative, voluntary program in which a farmer agrees to use the land within its capabilities, develop a conservation plan, and apply conservation practices to meet objectives and technical standards of the RCDs. In turn, the RCD agrees to furnish the farmer with information and technical assistance in order to carry out the conservation plan.

REGIONAL BOARD PROGRAM

PERMITTING/WAIVER OF PERMITS

Generally, discharges are subject to Waste Discharge Requirements (WDRs) issued by the Regional Board. However, the Regional Board may waive WDRs where such a waiver is not against the public interest and still assures the protection of beneficial uses of state waters. For the present, the Regional Board has been waiving WDRs for dairies where proper waste control facilities are in place and management practices are in conformance with the California Code of Regulations: Title 23, Article 3, Chapter 15 (Discharge of Waste to Land).

CONTINUING WASTE CONTROL PLANNING

In 1990, the State Board established a Dairy Waste Task Force to look at the dairy industry statewide and develop standards for dairy regulation. The main emphasis has been on developing better communication and guidance materials for the industry; developing a dairy survey form to help the Regional Boards determine if a dairy qualifies for a waiver from WDRs; determining the number and location of dairies; developing more uniform WDRs; and preparing an outreach program aimed at the dairy industry, local government, and the public.

The Regional Board directs the Executive Officer to continue the following staff activities:

- Work with the dairy industry through the local dairy waste committees, county farm bureaus, RCDs, and other local/state agencies in obtaining cooperative correction of dairy waste problems.
- Recommend adoption of WDRs in those cases where water quality objectives for waters within an agricultural watershed are consistently exceeded, or where corrective action is unsuccessful in eliminating either the short- or long-term water quality problems or threats. The Regional Board may choose to take enforcement action through the issuance of a Clean-up and Abatement Order or assess monetary penalties in those cases where dairy practices have resulted in or threaten to cause a condition of pollution or nuisance in surface waters through the issuance of an Administrative Civil Liability or referral to the California Attorney General's office.
- Monitor the compliance of dairy waste management programs with regional goals and implement the recommendations of the State Dairy Waste Task Force.

IRRIGATION OPERATIONS

An increase in the concentration of soluble salts contained in percolating irrigation water is an unavoidable result of consumptive use of water. Salt management within soils and groundwater is considered separate from water management, but is closely related to drainage control and wastewater operations. For irrigated agriculture to continue in the future, acceptable levels of salts in soils and groundwaters must be controlled.

Maintenance of a favorable salt balance, that being a reasonable balance between the import and export of salts from individual basins, must be considered to control increases in mineral content. This is especially applicable for the Livermore and Santa Clara Valley groundwater basins.

The ultimate consequences of regulatory action for irrigation operations must be carefully assessed. The "no-degradation" concept in connection with salt levels is not appropriate in all circumstances.

A concept of minimal degradation might be considered in some areas. It would need to be coupled with management of the surface and underground water supplies in order to assure acceptable degradation effects. If minimal degradation is considered, it can be offset by either recharge and replenishment of groundwater basins with higher quality water that will furnish dilution to the added salts, or by drainage of degraded waters at a sufficient rate to maintain low salts and salts leaving the basin. To aid recharge and dilution operations, additional winter runoff can be stored in surface reservoirs for subsequent use with either surface stream or groundwater basin quantity/quality management.

RECLAMATION

POLICY STATEMENT

To date in this region, disposal of most municipal and industrial wastewater has primarily involved discharges into the region's watersheds and the San Francisco Estuary system. With growing awareness of the impacts of toxic discharges, the drought, future urbanization, and growth on the local aquatic habitat, there is an increasing need to look for other sources of water. Increasingly, conservation and reclamation will be needed to deal with these long-term water issues. The Regional Board recognizes that people of the San Francisco Bay region are interested in developing the capacity to conserve and reclaim water to supplement existing water supplies, meet future water requirements, and restore the region's watersheds and estuarine system. Disposal of wastewater to inland, estuarine, or coastal waters is not considered a permanent solution where the potential exists for conservation and reclamation.

The Constitution of California, Article X, declares that, because of the conditions prevailing in the state, the general welfare requires that the water resources of the state be put to beneficial use to the fullest extent to which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is in the interest of the people and for the public welfare. California Water Code, Section 275, states that the Regional Board shall take all appropriate proceedings or actions to prevent waste, unreasonable use, or unreasonable method of use. In Section 13550, the legislature defines that the use of potable domestic water for the irrigation of greenbelt areas, including, but not limited to, cemeteries, golf courses, parks, and highway landscaped areas, is a waste or an unreasonable use of such water within the meaning of Section 2 of Article X of the California Constitution when suitable reclaimed water is available. In section 13510, the legislature states that the development of facilities to reclaim water is in the interest of the people of the state. In this section of the Water Code, the legislature intended that the state undertake all possible steps to encourage development of water reclamation facilities so that reclamation may be a significant source to meet the growing water needs of the state. Reclamation is defined as the process of augmenting the long-term dependable yield of the state's water supply by recapturing or treating wastewater, degraded or contaminated groundwater, or other nonpotable water for beneficial uses; its transportation to the place of use; and its actual use. Finally, Section 13225(l) mandates that the Regional Board encourage regional planning and action for water quality control.

REGULATORY REQUIREMENTS

If reclamation is to be made feasible and efficiently utilize the water resources of the state, there are certain issues that will have to be addressed on a statewide and regional basis.

More than 850 reclamation projects are cur-

rently operating successfully in California. The California Department of Toxic Substances Control (DTSC) and local health and regulatory agencies have been integrally involved in both the development and operation of all of these projects. In the past decade, there have been significant improvements in the design and operation of reclamation facilities and in health monitoring and analysis. As a result, the DTSC is currently revising the California Code of Regulations, Title 22: Wastewater Reclamation Criteria, to make it consistent with existing capabilities. These revisions should allow for the expansion of possible uses for reclaimed water. In order to implement reclamation more effectively, it is recommended that: 1) research into environmental and health effects be conducted in those areas where information is still lacking or inconclusive; 2) cooperation and participation be sought from professionals from both the water reclamation industry and the health and regulatory agencies to assure that the criteria developed are both attainable and appropriate; 3) uniform guidelines be jointly developed and implemented by state and local health and regulatory officials; and 4) guidelines and regulations be allowed to evolve in a timely fashion to reflect technological advances and operational experience.

In order to uphold the state's Antidegradation Policy, reclamation project requirements and water quality objectives should be developed that consider the public health risks protected under Title 22 and potential environmental risks that may impact water quality and beneficial uses. The DTSC and the State and Regional Boards must develop discharge standards and treatment requirements for reclaimed water used for groundwater recharge requirements as well as recharge site requirements. In addition, groundwater quality objectives set in the Basin Plan must be updated and expanded to include constituents of concern, particularly metals and organic chemicals.

The Regional Board adopted Order No. 91-042, which is incorporated by reference into this plan, to allow certain pre-approved waste dischargers to issue their own permits for the use of reclaimed water. Specific guidelines are included in the order. Uses are limited to those that do not have unrestricted access or exposure. Requirements conform to statewide reclamation criteria established by DTSC as prescribed in Title 22, Sections 60301-60335, California Code of Regulations.

Enforcing the water quality nondegradation standards will require better monitoring and assessment of wastewater and ambient water quality. Those entities implementing any major use of reclaimed water will need to implement and regulate consistent monitoring programs.

SOURCE QUALITY CONTROL

The quality of influent to a reclamation plant affects the quality of effluent production, particularly in those communities that import high quality surface water from the Sierra Nevada. Reclamation treatment and costs are directly dependent on the quality of influent into the plant. The quality of this influent depends on the quality of the water supply and the quality of the waste discharges to the reclamation plant. Reclamation requires that industrial pretreatment and pollution prevention programs be sufficient to remove toxic constituents. Reclamation also requires adequate monitoring and enforcement. Additionally, maximum recycling and separate treatment of waste by industries should be encouraged where feasible. Educational programs for industries and households on the appropriate handling and disposal of potentially toxic materials should be part of any pretreatment and pollution prevention program.

GOVERNMENTAL COORDINATION

Implementation of reclamation projects requires the involvement, approval, and support of a number of agencies, including state and local health departments, the Regional Board, local POTWs and water districts, and land-use planning agencies. Interagency coordination must be a priority of all parties involved in reclamation. Failure to coordinate activities can result in the inability to carry out reclamation projects in a timely, consistent, and cost-effective manner. The Regional Board seeks cooperation and participation of professionals from the water reclamation industry and the water, health, and regulatory agencies to assure the development of criteria that are both attainable and appropriate. To facilitate inter- and intra-regional reclamation projects, interagency coordination is necessary when the wastewater agency produces reclaimed water outside of an interested water purveyor's service area. Effective communication and cooperation between agencies regarding distribution and service is vital and should begin early in the planning process. This would assure to the water purveyor that there will be no duplication of service, enable interagency agreement on project

development and implementation, and help avoid any unnecessary delays that could jeopardize a project.

Future reclamation prospects are also dependent on effective coordination between reclamation agencies and land-use planning agencies. Many reclamation ordinances in the state require dual distribution systems in new high-rise buildings and other new developments. This requires that a land-use planning agency mandate the use of reclaimed water as a condition of development approval. In addition, efforts of regulatory agencies, such as the State Board, Regional Board, DOHS, and county health departments, should be coordinated to minimize conflicts or confusion when projects are permitted.

MUNICIPAL WASTEWATER SLUDGE MANAGEMENT

One particular type of solid waste is wastewater sludge, a by-product of wastewater treatment. Raw sludge usually contains 93 to 99.5 percent water, with the balance being solids that were present in the wastewater and that were added to or cultured by wastewater treatment processes. Most POTWs treat the sludge prior to ultimate use or disposal. Normally this treatment consists of dewatering and/or digestion. In some cases, such as at the Palo Alto treatment plant, the sludge is incinerated.

Treated and untreated sludges often contain high concentrations of toxic metals and often contain significant amounts of toxic organic pollutants and pathogens. The storage and disposal of municipal sludges on land can result in degradation of ground and surface water if not properly performed. Therefore, sludge handling and disposal must be regulated.

On February 19, 1993, U.S. EPA promulgated national standards regulating the use or disposal of non-hazardous sewage sludge (40 CFR Part 503, et.seq.). Part 503 regulations primarily affect sewage sludge (also known as "biosolids") use and disposal by incineration, surface disposal, and land application (including distribution and marketing). Part 503 regulations also establish pollutant limits, operational and maintenance practices, monitoring frequency, recordkeeping, and reporting requirements. The federal definition of sewage sludge includes domestic septage (from septic tanks, cesspool, portable toilet, etc.). Disposal in a municipal solid waste landfill (MSWLF) is not considered surface disposal. Thus, the MSWLF is not regulated by the national sewage sludge program.

The State of California has neither requested nor been granted the delegation of the federal sewage sludge management program at this time. Therefore, U.S. EPA will be responsible for implementation and enforcement of the national rule. Under the rule, facilities that must apply for a permit include the generators, treaters, and disposers of sewage sludge. Nevertheless, 40 CFR Part 503 has, for the most part, been written to be self-implementing. This means that anyone who uses or disposes of sewage sludge regulated by 40 CFR Part 503 must comply with all the provisions of the rule, whether or not a permit has been issued.

State regulations of the handling and disposal of sludge are contained in Chapter 15 and DTSC standards for hazardous waste management. Prior to promulgation of the national rule, sewage sludge facilities were regulated by the Regional Board through the issuance of site-specific waste discharge requirements. The Regional Board may continue to regulate certain sewage sludge facilities when believed to be necessary for the protection of water quality.

ON-SITE WASTEWATER TREATMENT AND DISPOSAL SYSTEMS

As the population of the Bay Area increases, demand for new development increases. In many cases, new development is occurring close to sewerage agencies. More often, however, development is being proposed in outlying areas that cannot be served by existing sewerage agencies. In those instances, new discrete sewerage systems are being proposed (i.e., new systems separate from existing public sewerage systems). Today there are more than 110,000 septic tank soil adsorption systems (septic systems) and cesspools throughout the Bay Area, and approximately 1,000 new septic systems are approved each year.

In response to these development pressures, the Regional Board adopted a Policy on Discrete Facilities in 1978. The policy set forth the actions the Regional Board will take with respect to proposals for individual or community sewerage systems serving new residential development. An important provision of the policy required the development of guidelines for the control of individual waste-

water treatment and disposal systems. The Regional Board's policy and guidelines are presented below.

POLICY ON DISCRETE SEWERAGE FACILITIES

The policy enumerates the following principles, which apply to all wastewater discharges:

- The system must be designed and constructed so as to be capable of preventing pollution or contamination of the waters of the state or creating nuisance for the life of the development;
- The system must be operated, maintained, and monitored so as to continually prevent pollution or contamination of the waters of the state and the creation of a nuisance;
- The responsibility for both of the above must be clearly and legally assumed by a public entity with the financial and legal capability to assure that the system provides protection to the quality of the waters of the state for the life of the development.

The policy also makes the following requests of city and county governments:

- That the use of new discrete sewerage systems be prohibited where existing community sewerage systems are reasonably available;
- That the use of individual septic systems for any subdivision of land be prohibited unless the governing body having jurisdiction determines that the use of the septic systems is in the best public interest and that the existing quality of the waters of the state is maintained consistent with the State Board's Resolution 68-16; and
- That the cumulative impacts of individual disposal system discharges be considered as part of the approval process for development.

Finally, the policy also requires that a public entity assume legal authority and responsibility for new community wastewater treatment and disposal systems. Community systems are defined as collection sewers plus treatment facilities serving multiple discharges under separate ownership, such as package plants or common septic tanks, plus disposal facilities such as evaporation ponds or leachfields. This policy requires local governments, during the approval process, to consider either the formation of a new government entity or the assumption of this responsibility by an existing entity.

INDIVIDUAL SYSTEM GUIDELINES

Since the early 1960s, the Regional Board, pursuant to Section 13296 of the California Water Code, adopted waivers for reporting certain septic system discharges in all Bay Area counties except San Francisco. In its policy, the Regional Board required the development of individual system guidelines concentrating mainly on septic systems. These guidelines provided information on system design and construction, operation and maintenance, and the conduct of cumulative impact studies.

On April 17, 1979, the Regional Board adopted Resolution No. 79-5: Minimum Guidelines for the Control of Individual Wastewater Treatment and Disposal Systems (Minimum Guidelines). The guidelines concentrated mainly on septic systems, providing information on system design and construction, operation and maintenance, and the conduct of cumulative impact studies.

ALTERNATIVE ON-SITE WASTEWATER SYSTEMS

Although the conventional septic system has long been one of the most reliable methods of on-site sewage disposal, there are widespread conditions throughout the region that restrict its use, including conditions of high groundwater and shallow or impermeable soils. In recent years, there has been active interest and research in the development of alternative means of on-site sewage disposal techniques to overcome these adverse conditions. One such alternative is the mound design developed by the University of Wisconsin at Madison.

It should be pointed out that the conditions (i.e., soils, groundwater, slope) that limit the use of conventional septic systems apply to alternative systems as well, since all such systems ultimately rely on soil adsorption of all or most of the wastewater generated. More importantly, failures of alternative septic systems are likely to be very difficult to correct given that conventional systems would not be suitable as a fallback. Moreover, most alternative systems require a high degree of design expertise, which increases the danger of faulty design and complicates the review of various proposals. Finally, most alternative designs require a far more intensive and sophisticated operation and maintenance

effort by the homeowner, which past experience suggests will not be forthcoming.

Recognizing the need for a position on alternative systems, the Regional Board adopted the following statement in its Minimum Guidelines:

"The Regional Board Executive Officer may authorize the Health Officer to approve alternative systems when all of the following conditions are met:

a. Where the Health Officer has approved the system pursuant to criteria approved by the Regional Board Executive Officer;

b. Where the Health Officer has informed the Regional Board Executive Officer of the proposal to use the alternative system and the finding made in (a) above; and

c. Where a public entity assumes responsibility of the inspecting, monitoring, and enforcing the maintenance of the system through:

   (i) Provision of the commitment and the necessary legal powers to inspect, monitor, and when necessary to abate/repair the system; and

   (ii) Provision of a program for funding to accomplish (i) above."

The fundamental point is that alternative systems will be approved only if adequate design review is provided, and if a county or some other public agency assumes ultimate responsibility for correction of failures. This goes beyond a county's existing regulatory system under which the county can order correction of failed systems, but has no practical means of ensuring this is done.

What is contemplated is a system by which the county would, as a last resort, arrange for a correction to be made even over a homeowner's objection. The homeowner could be billed for engineering and construction costs, and ultimate payment assured by a lien on the property. A service district such as this has been used with success in Stinson Beach and would be one means of implementing this regulatory system, but the county could probably acquire the necessary powers directly.

Local agencies may approve and permit certain types of alternative on-site systems. The Regional Board will consider the local agency's alternative system program, in accordance with the Regional Board's position on alternative systems discussed above. An acceptable program should include siting and design criteria for the types of alternative systems being approved, procedures for on-going inspection, monitoring, and evaluation of these systems, and appropriate local regulations for implementation and enforcement of the program. Such authorization may be granted through an Memorandum of Understanding (MOU) between the Regional Board and the local agency. Typically, that agency will be the county environmental health department. The MOU provides a means for identifying the responsibilities of both the Regional Board and the local agency, such as mutually agreed siting, design, and construction criteria and guidelines for the operation, maintenance, and monitoring of alternative systems.

Alternative on-site system designs should be substantiated by suitable reference materials, including previous field testing and documentation of successful performance under site and soil conditions similar to the local conditions. System designs that have not been fully proven under proposed conditions will be considered experimental and treated with caution. In general, experimental systems will require more careful siting and design review and, if approved, intensive monitoring and inspection to ensure adequate system operation and performance.

GRAYWATER DISPOSAL SYSTEMS

On March 8, 1994, the California Building Standards Commission approved new graywater rules developed by the California Department of Water Resources (DWR). These rules became effective on November 8, 1994, and supersede local graywater regulations.

Under DWR's rules, a homeowner, builder, developer, or other owner of a single dwelling may plumb such dwellings for and install now or later a collection, filtration, and subsurface irrigation system using water from showers, tubs, clothes washers, and bathroom and laundry sinks. The treated graywater is to be used for subsurface landscape irrigation.

Cities and counties have authority to develop policies and procedures for the implementation of graywater programs. In developing these, consultation with the Regional Board and local water districts can ensure that potential impacts on local water quality are taken into consideration.

EROSION AND SEDIMENT CONTROL

Current estimates of annual sediment inflow to San Francisco Bay are 5.9 million cubic yards, with 3.9 million cubic yards contributed through the Delta and 2.0 million cubic yards from Bay Area tributary streams. By the year 2000, ABAG has estimated that approximately 322,500 acres of land area will be converted to urban use. This is a 73 percent increase above the 1975 urbanized land area. This increase in urbanized land use can be expected to be the future source of much of the sediment that will reach area rivers, streams, and channels, and ultimately the Bay system each year.

Soil erosion and related water quality impacts may result from a wide variety of causes, including construction, hillside cultivation, non-maintained roads, timber harvesting, improper hiking/biking trail use, and off-road vehicles.

Natural erosion processes are accelerated when existing protective cover is removed before, during, and following construction and agricultural activities. Studies relate that erosion on land where construction activities are taking place is about ten times greater than on land in cultivated row crops, 200 times greater than on pasture land, and 2,000 times greater than on timber land that has not been logged.

The exposure of the soil mantle to falling rain, overland and channelized flow, and the impact of equipment moving over the site results in the increased movement and loss of soil.

Damage from erosion and sedimentation can be categorized in the following ways:

- Damage to construction sites;
- Damage to stream channels;
- Damage to water quality/beneficial uses;
- Damage to public and private property; and
- Damage to agricultural lands.

In most cases, the adverse results of human activities can be reduced, and in some instances eliminated, through the use of both structural and non-structural measures of various types that are properly employed at the appropriate time. The high cost of lost resources, resource replenishment, and after-the-fact repair and maintenance make both pre-project erosion control planning and preventive maintenance necessary. The goal of and the program for erosion and sediment control are summarized below.

GOAL

The goal of the Regional Board's Erosion and Sediment Control Program is to reduce and prevent accelerated (human-caused) erosion to the level necessary to restore and protect beneficial uses of receiving waters now significantly impaired, or threatened with impairment, by sediment.

This goal is to be attained through implementation of proper soil management practices. Voluntary implementation is encouraged, but enforcement authority will be exercised where beneficial uses of water are clearly threatened by poor soil management practices.

PROGRAM

In May of 1980, the Regional Board adopted two separate items to alert local governments to the Board's concern on erosion control problems related to construction activities. The first item was a statement of intent (Resolution No. 80-5) regarding erosion control which stated that the Regional Board:

- Recognizes that water quality problems are associated with construction-related activities;
- Recognizes ABAG's progress in developing erosion and sediment control regulatory programs and assistance to local governments to implement these programs;
- Recognizes local governments' power to adopt and implement these programs;
- Intends to strengthen its position with regard to regulation of sediment and erosion control problems, especially with regard to construction activities; and
- Intends to take appropriate enforcement action pursuant to the California Water Code in cases where land development or other construction activity causes or threatens to cause adverse water quality impacts associated with erosion problems and intends to consider, during enforcement actions, whether local government negligently contributed to the problem due to failure to adopt and/or effectively enforce erosion control programs.

The second item was a Memorandum of Understanding negotiated with the Council of Bay Area Resource Conservation Districts that is intended to provide the following:

- Assessment, control, and monitoring of potential and existing soil erosion-related water quality problems,
- Improvement of coordination between the Resource Conservation Districts and the Regional Board; and
- Monitoring of local government progress on the adoption and implementation of erosion and sediment control ordinances.

The Regional Board has recognized and encouraged the efforts that ABAG has made since mid-1980 in working with local Bay Area governments to improve their ordinance and regulatory programs on erosion and sediment control.

By the end of 1995, ABAG will have updated its 1980 *Manual of Standards for Erosion and Sediment Control Measures*. During the 1993-94 rainfall season, a number of erosion problems associated with construction activities were noted. These problems would probably have been far better controlled if local government erosion ordinances and regulatory programs had been in line with those recommended by ABAG.

The Regional Board intends to follow the guidelines listed below in regulating erosion and sedimentation for the protection of beneficial uses of water.

1. Local units of government with land-use planning authority should have the lead role in controlling land-use activities that cause erosion and may, as necessary, impose further conditions, restrictions, or limitations on waste disposal or other activities that might degrade the quality of waters of the state.
2. Best Management Practices (BMPs) should be implemented to reduce erosion and sedimentation and minimize adverse effects on water quality. A BMP is a practice or combination of practices determined to be the most effective and practicable means to prevent or reduce erosion and sediment-related water quality degradation. Examples of control measures are contained in the *Manual of Standards for Erosion and Sediment Control Measures*. Further technical guidance can be obtained from the Resource Conservation Districts.
3. Local governments should develop an effective erosion and sediment control ordinance and regulatory program. An effective ordinance and regulatory program must:
   - Be at least comparable to the model ordinances in ABAG's *Manual of Standards for Erosion and Sediment Control Measures*;
   - State that water quality protection is an explicit goal of the ordinance;
   - Require preparation of erosion and sediment control plans consistent with the *Manual of Standards* with specific attention to both off-site and on-site impacts;
   - Provide for installation of approved control measures no later than October 15 of each year; and
   - Have provisions for site inspections with follow up at appropriate times, posting of financial assurances for implementation of control measures, and an enforcement program to assure compliance with the ordinance.
4. All persons proposing alterations to land (over five acres) are required to file a Report of Waste Discharge and/or an Erosion Control Plan with the Regional Board. A statewide general NPDES permit aimed at minimizing erosion from the proposed activities has been issued.

   In addition, the Regional Board may find that any water quality problems caused by erosion and sedimentation for such a project were due to the negligent lack of an adequate erosion control ordinance and enforcement program by the local permitting agency. Such a finding of negligence could subject a permitting agency to liability for indemnification to a developer if civil monetary remedies are recovered by the state.
5. The Regional Board may take enforcement action pursuant to the California Water Code to require the responsible persons (including local permitting agencies) to clean up and abate water quality problems caused by erosion and sedimentation in the event that the local permitting agency fails to take the necessary corrective action.

DREDGING AND DISPOSAL OF DREDGED SEDIMENT

BACKGROUND

Dredging and dredged sediment disposal in the San Francisco Bay Area is an ongoing

activity because of continual shoaling that impedes navigation and other water-dependent activities. Large volumes of sediment are transported in the waters of the Sacramento and San Joaquin rivers, which drain the Central Valley. The average annual sediment load to the San Francisco Bay system from these two rivers is estimated to be eight million cubic yards. Of this amount, some four million cubic yards are transported out of the Bay through the Golden Gate. The remaining four million cubic yards are circulated and/or deposited in the Bay. In addition, some two-and-one-half million cubic yards are deposited into the Bay from local watersheds.

Annual maintenance dredging of shipping channels, harbors, and marinas in the San Francisco Bay results in disposal of between two and eight million cubic yards of dredged material at in-bay disposal sites. There are currently three designated disposal sites for use by the U.S. Army Corps, the Navy and other dredgers. Additionally, the Corps disposes of material from several projects at designated sites in Suisun Bay and on the San Francisco Bar (west of the Golden Gate). All aquatic dredged material disposal sites are operated as "dispersive" sites, that is, material disposed at the sites is intended to disperse and be carried by currents out to sea.

REGULATORY FRAMEWORK

The Corps of Engineers issues federal permits for dredging projects pursuant to Section 404 of the Clean Water Act. As a part of this permitting process, the dredging permit applicant must seek water quality certification from the State of California, in accordance with Section 401 of the Clean Water Act. Currently the applicant must contact the Regional Board for 401 certification. The Regional Board may waive certification, or it may recommend to the Executive Director of the State Board that certification be granted or denied. Water quality certifications often contain conditions that the permittee must meet during the term of the permit. For example, certifications often contain conditions requiring periodic testing of the dredged material, or avoidance of sensitive ecological areas and spawning grounds. The Bay Conservation and Development Commission (BCDC) also regulates dredging and disposal under the provisions of the McAteer-Petris Act.

ENVIRONMENTAL IMPACTS OF DREDGING AND DISPOSAL IN THE AQUATIC ENVIRONMENT

During the late 1980s and continuing to the present, concern over the potential impacts of dredged sediment disposal in San Francisco Bay has increased substantially, forcing regulatory agencies to reexamine their dredging policies. The Regional Board, during its triennial review of the Basin Plan in 1986, stated its intention to update and revise its dredged sediment disposal policy for San Francisco Bay. During the triennial review, the Regional Board recognized that periodic dredging is necessary to maintain the beneficial use presented by navigation and other water-dependent activities. The Regional Board also stated its intention to institute a more rigorous testing program to determine the suitability of dredged sediment for unconfined aquatic disposal in San Francisco Bay.

Most dredging and dredge material disposal operations cause localized and ephemeral impacts with related biological consequences (Table 4-12). In August, 1980, the Regional Board adopted a general policy (Resolution No. 80-10) for the regulation of dredge sediment disposal. Many concerns have been raised about the adequacy of the Corps' regional procedures to identify potential pollution conditions. One area of concern is implicit in the guidelines and protocol for testing of sediment for ocean disposal. The current ocean disposal criteria (pursuant to the Marine Protection, Research, and Sanctuaries Act) are more stringent than the inland criteria (governed under the Clean Water Act). In the 1980s, it was determined that the Alcatraz disposal site was accumulating significant amounts of material, with the depth of the site going from the original 110 feet to 30 feet. The mounding at the disposal site ultimately became a threat to navigation. The Corps eventually dredged the Alcatraz site to increase the depth, redistributing the material within the disposal area several times between 1984 and 1986.

In September of 1988, Regional Board staff circulated and presented an issue paper entitled "A Review of Issues and Policies Related to Dredge Spoil Disposal in San Francisco Bay." The issue paper discussed the major environmental concerns posed by dredged sediment disposal in San Francisco Bay, namely: 1) mounding at the Alcatraz disposal site, which posed a navigational hazard and has the potential to alter circulation patterns in the Bay; 2) the disposal of increasingly large amounts of material has the potential to

alter benthic and shoreline habitats and to increase water column turbidity; and 3) the resuspension of dredged sediments may increase contaminant bioavailability. The issue paper presented a range of alternative strategies for the Regional Board to consider. Public and agency testimony was received by the Regional Board during hearings on September 15, 1988, and October 19, 1988. Agencies testifying included the Corps, U.S. EPA, and the California Department of Fish and Game. In the issue paper, Regional Board staff recommended that the Regional Board consider adopting quantity and quality limits for the disposal of dredged sediment at unconfined aquatic disposal sites within San Francisco Bay.

Additionally, the Regional Board and the Corps took steps to prevent further "mounding" at the region's single largest disposal site, the Alcatraz site. In 1989, the Regional Board adopted volume targets, which served to prevent over-filling of the region's three aquatic disposal sites. BCDC also revised its policies to restrict in-bay disposal. Land disposal avoids many of the potential adverse impacts in aquatic systems. A different set of potential environmental impacts is associated with land disposal, but so is the opportunity for creating environmental benefits.

DREDGING STUDY PROGRAMS

DREDGING MANAGEMENT PROGRAM

In the late 1980s, the Corps of Engineers undertook a series of local dredging studies as a part of the Dredging Management Program (DMP). Additionally, the Corps nationally undertook a demonstration program to examine the environmental impacts from various dredged material disposal practices. The goal of these programs was to examine: 1) factors associated with aquatic disposal practices, 2) characteristics of dredged material, 3) alternative methods of disposal, and 4) dredging technology. However, because the DMP was conducted internally, was not consensus-based, and did not fully involve other state and federal agencies, environmental groups and the dredging community, concern and conflict continued to surround dredging in San Francisco Bay. One particularly notable instance of continued conflict was a 1989 protest and blockade of the aquatic disposal sites by environmental and fishing interests. In the fall of 1989 and in early 1990, the Corps undertook a new approach to studying environmental issues surrounding dredging and disposal site management.

LONG-TERM MANAGEMENT STRATEGY

The new approach, called the Long Term Management Strategy (LTMS) for dredged material, was designed as a cooperative process based on active participation by state and federal permitting agencies. The lead LTMS agencies share four basic goals related to the fact that dredging is important both economically and environmentally (Table 4-13). The LTMS structure is a pyramid form with technical committees at the base and appointed state and federal agency administrators at the top (Table 4-14). Three staff-level committees, or "workgroups," were charged with addressing technical issues and managing environmental studies. The Corps of Engineers, San Francisco District, was charged with general coordination, contracting, and administrative functions. Later in the process, a fourth committee was formed to carry out various LTMS implementation tasks. The implementation committee has been primarily concerned with permit coordination and streamlining, but has also attempted to address inequities in upland disposal site financing, upland/non-tidal site acquisition, and changes to federal dredging policy. Above the technical and implementation committees is the Management Committee, represented by management executives from five key LTMS agencies. The Management Committee, in turn, takes direction from the Executive Committee. The Executive Committee consists of the chairpersons of the Regional Board and BCDC, the U.S. EPA Regional Administrator, the state Dredging Coordinator (governor appointed), and the commander of the South Pacific Division, Corps of Engineers. Broad public input is gained via the Policy Review Committee, which meets quarterly to review the work and progress of LTMS.

THE LTMS PROCESS

The LTMS process allows participation by resource agencies, environmental groups, and the maritime industry. In 1990, the LTMS Study Plan was approved by the participating agencies. The Study Plan outlined the LTMS process, relevant scientific fields, and "gaps" in knowledge. Technical work groups were established to examine: 1) deep ocean disposal, 2) in-bay aquatic disposal, and 3) upland/non-aquatic disposal and reuse. Staff at the Regional Board, BCDC, and U.S. EPA were appointed to chair the three work groups (Table 4-14). Each committee was budgeted funds by the Corps in order to carry out approved studies. Throughout LTMS process, the Corps has retained responsibility for contract management, budgets, and other admin-

istrative duties. For the first several years of the program, the In-bay Studies Work Group also served as a part of the San Francisco Estuary Project, as it was also designated as the subcommittee on "Dredging and Waterway Modification."

The LTMS process has resulted in new findings regarding sediment toxicity testing and transport, the development of new testing procedures, and new approaches to disposal of dredged material. Additionally, LTMS participants continue to work toward better disposal site management, and, perhaps more importantly, an increased level of coordination and cooperation among those involved with dredging. Participating federal and state permitting and resources agencies receive technical and policy input from dredging, environmental, and fishing communities through the LTMS structure.

OCEAN STUDIES

The Ocean Studies Work Group, funded through LTMS, provided input on U.S. EPA's study and designation of a deep ocean disposal site for dredged material. The group oversaw studies in the areas of sediment transport modeling, benthic ecology, and environmental risk. The results of various technical studies were compiled in an Environmental Impact Statement (EIS) in which five disposal sites were considered.

U.S. EPA completed an EIS on ocean disposal in August, 1993. Concurrent with and following work on the EIS, U.S. EPA, with input from LTMS, moved closer to disposal site use by completing a Site Management and Monitoring Plan. The designated deep ocean disposal site is located about 58 miles offshore, beyond the boundaries of the Monterey Bay and Gulf of Farallones National Marine Sanctuaries, in waters that are 6,000 to 9,000 feet deep. The site was formally designated by U.S. EPA on August 11, 1994 (59 Federal Register Section 41243 et seq.). It is expected that the ocean site will be used for disposal of dredged material from large new work and maintenance dredging projects.

IN-BAY STUDIES

In-bay disposal studies were undertaken to address several key areas of concern. Following the general terms of the LTMS Study Plan, the In-bay Work Group examined key environmental concerns in the following areas:

- Physical effects of disposal, including turbidity;
- Physical processes, including fate and transport of material from the disposal sites using numerical modeling;
- Toxicological issues, including release of contaminants during disposal and ecological fate of contaminants;
- Non-treatment effects in sediment toxicity tests;
- Bioaccumulation;
- Methods to reduce the need for dredging; and
- Sampling and analysis methods for sediment testing.

Most of the LTMS in-bay studies were completed by the end of 1994; however, several documents remain in draft form.

UPLAND AND NON-TIDAL/REUSE STUDIES

The Upland Studies Program focused on the evaluation of the potential for upland disposal and the use of dredged material as a resource. The group conducted planning-level feasibility studies of potential sites in San Francisco Bay and the Delta. Studies examined the engineering, biological, and hydrological aspects of wetland restoration using dredged material, as well as various regulatory and planning issues surrounding upland reuse. Other issues studied by the group included remedial technologies for treating contaminated sediments, an analysis of seasonal and tidal wetlands in the North Bay, and a feasibility study of potential sediment rehandling sites.

The LTMS technical studies have added to our information base and have filled some of the "data gaps" that were originally identified in the LTMS Study Plan. In many cases, LTMS studies have confirmed our conceptual views and hypotheses about how the Estuary and the ecosystem function.

WETLAND RESTORATION USING DREDGED MATERIAL

While the Regional Board remains concerned about the impacts of both polluted and clean sediments on the San Francisco Estuary, much of the sediment disposed of in the region is not polluted and could be used in beneficial ways (termed "reuse"). One of these uses involves the restoration of tidal marshes in areas that were once part of the Bay. These areas, known as diked historic baylands, were once open to the tides and were thriving salt marsh and mudflat ecosys-

tems (discussed further under the "Wetlands Protection and Management" section). Decades of land "reclamation," first initiated in the 1800s, resulted in diked agricultural lands, the land surface of which has subsided for a variety of reasons.

In order to foster growth of marsh vegetation and proper slough channel formation, the new marsh must be built near mean high tide. In many cases it will be beneficial to place a layer of sediment across the site to raise the elevation of the land surface to a point near the mean tide line. LTMS studies have examined the environmental, engineering, and economic considerations that are involved in restoring certain sites. The studies commissioned by LTMS have shown that, given current laws and policies, placement of dredged sediment at wetland restoration projects may cost more than traditional in-bay disposal, but less than ocean disposal.

SONOMA BAYLANDS

One example of this concept is the Sonoma Baylands Wetlands Demonstration Project. The Sonoma Baylands property, which was formerly used for hay production, was acquired by the Sonoma Land Trust for preservation as undeveloped open space. The Sonoma Baylands project was managed by the State Coastal Conservancy, which facilitated a partnership between the Corps and the Port of Oakland. Federal legislation was necessary to allow the Corps to direct the construction of the project. The Corps began filling the site with dredged sediment in the fall, 1995, with completion expected in late 1996. The 322-acre Sonoma Baylands site will require some two-and-a-half million cubic yards of sediment prior to contact with tidal waters. The Regional Board has issued a permit for the construction of Sonoma Baylands, regulating the placement of dredged sediment and runoff water from the site. Tidal marsh vegetation is expected to be established within five years of construction.

MONTEZUMA WETLANDS RESTORATION PROJECT

The Montezuma Wetlands Restoration Project is planned on an even larger scale. The Montezuma project site is located on the northern boundary of Suisun Bay at Collinsville. The site, which is adjacent to the Suisun Marsh reserve, is currently used for sheep ranching and commercial pheasant hunting. The Montezuma project involves restoration of approximately 1,800 acres of diked historic baylands to tidal action. Like the Sonoma Baylands site, dredged sediment would be placed at Montezuma in order to account for the heavy subsidence that has occurred at the site. In some areas, up to seven feet of sediment would be necessary to bring the site to a proper elevation for wetland creation. Because the Montezuma site has subsided so much, the quantity of material that potentially will be placed there is in the range of 20 million cubic yards. The Montezuma project is currently undergoing CEQA review.

REGIONAL BOARD POLICIES ON DREDGING AND DREDGED SEDIMENT DISPOSAL

1. NEED FOR REGIONAL AND LOCAL MONITORING

The Regional Board recognizes that the continued disposal of dredged material from maintenance work will require a demonstration that such disposal will not result in significant or irreversible impacts in San Francisco Bay. The Corps' and other major dredgers' active participation in environmental studies and in testing and monitoring programs are absolutely necessary in order to find solutions to the dredging problems in the region.

2. MATERIAL DISPOSAL RESTRICTION

Materials disposed of at approved aquatic dredged material disposal sites shall be restricted to dredged sediment. Disposal of rock, timber, general refuse, and other materials shall be prohibited.

3. VOLUME TARGETS

Volume targets for each disposal site were developed based on understandings of sediment dynamics and historical information regarding disposal volumes (Table 4-15). An examination of disposal patterns at all aquatic disposal sites in San Francisco Bay revealed that the Carquinez Straits area may be influenced by wet weather events. The volume targets for the Carquinez Straits disposal site are 3.0 million cubic yards for wet and above normal years and 2.0 million cubic yards for all other year classifications.

In addition, the Regional Board established a volume target of 0.2 million cubic yards per year for the Suisun Bay Channel disposal site and restricts its use to Corps maintenance dredging. The San Francisco Bar site is used for disposal of material from the bar channel. The use of the San Francisco Bar disposal site is regulated under the Marine Protection, Research, and Sanctuaries Act.

4. VOLUME TARGET IMPLEMENTATION

The Regional Board will consider denial of water quality certification for any project proposing to place material at a disposal site for which the annual or monthly volume target has been exceeded. Small project proponents may apply for an exemption to monthly or annual volume targets and new work disposal in San Francisco Bay. A small project is defined as a facility or project whose design depth does not exceed -12 feet Mean Lower Low Water (MLLW). The project proponent must demonstrate:

a. That the additional burden placed upon the applicant would be inordinate relative to the beneficial uses protected; and

b. That the proposed discharge is less than 20,000 cubic yards in one year and not to exceed 50,000 cubic yards over five years.

5. USE OF TESTING GUIDELINES

The Regional Board's Executive Officer will continue to require technical data according to Public Notice 93-2, "Testing Guidelines for Dredged Material Disposal at San Francisco Bay Sites," which is incorporated by reference into this plan. In June of 1994, the Corps and U.S. EPA published the draft "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. (Draft), Inland Testing Manual (ITM)." The ITM is intended to provide comprehensive guidance to dredging applicants on sampling and testing of sediment. The ITM outlines a tiered approach to sediment testing, similar to the existing Ocean Disposal Testing Manual, or "Green Book," which was written by the federal government for ocean disposal (pursuant to MPRSA).

The Regional Board is working in cooperation with other LTMS agencies to develop a regional implementation manual that will detail how the ITM will be implemented in the San Francisco Bay Area. The ITM was intended to only address testing of material for aquatic disposal and does not provide a protocol for upland disposal. Disposal of dredged material in other environments for beneficial reuse, e.g., wetland restoration, landfill daily cover, and levee bolstering, will be subject to site-specific guidance provided by the Regional Board.

The Executive Officer, following consultation with other agencies, will periodically review and update all testing procedures. The Executive Officer may require additional data collection beyond the tiered-testing procedures on a case-by-case basis.

6. APPLICABILITY OF WASTE DISCHARGE REQUIREMENTS

The Regional Board will consider issuing waste discharge requirements for individual dredging projects unless the Executive Officer has waived such requirements in accordance with Resolution No. 83-3, which is incorporated by reference into this plan (see Chapter 5).

7. DREDGING WINDOWS

The Regional Board will restrict dredging or dredge disposal activities during certain periods ("windows") in order to protect the beneficial uses of San Francisco Bay. These beneficial uses include water contact recreation; ocean, commercial, and sport fishing; marine habitat; fish migration; fish spawning; shellfish harvesting; and estuarine habitat. These restrictions may include but are not limited to:

a. Dredging activities from December through February in selected sites along the waterfront where Pacific herring are known to spawn; and

b. Disposal activities at the Carquinez Straits site during spring and fall in order to protect striped bass and salmon migrations.

CURRENT CORPS OF ENGINEERS' POLICY ON VOLUME OF MATERIAL DISPOSED OF AT THE ALCATRAZ DISPOSAL SITE

On February 1, 1993, the Corps of Engineers released a proposed policy as Public Notice 93-3, which further limited allowable monthly disposal volumes at the Alcatraz disposal site (SF-11). The Corps stated that the "existing maximum volume targets have been determined to be inadequate to maintain the site for continued dredged material disposal." The Corps' change in policy in the Public Notice reduces monthly volume limits for the Alcatraz site below what has been adopted by the Regional Board (Table 4-15). However, the Corps' policy does not address annual limits; it reserves exclusive use of the site for Corps-maintained projects if deemed necessary; and it allows other dredgers to dispose of material at the San Pablo Bay site (SF-10), when and if the Alcatraz site has reached capacity. Of course, the Corps may change its policy independently of the Regional Board and other agencies.

8. IMPACTS AT DREDGE SITE

The Regional Board may require additional documentation and inspections during dredging activities in order to ensure that dredgers minimize impacts at the dredging location. Water quality certifications or waste discharge requirements may contain additional conditions to address barge overflow and other impacts at the dredging site. Permit conditions may include:

- Special reporting procedures for the hydraulic pumping of dredged material into transport scows prior to disposal (marina slip applications);
- Time limit on the overflow from hopper-type hydraulic dredges in order to obtain an economical load; or
- Precautions to minimize overflow and spillage from the dredging vessel when enroute to the authorized disposal site. (Appreciable loss during transit shall be considered unauthorized disposal, or "short dumping," and such occurrences are subject to enforcement by the Regional Board or other applicable state or federal agencies.)

9. POLICY ON LAND AND OCEAN DISPOSAL

The Regional Board shall continue to encourage land and ocean disposal alternatives whenever practical. Regional Board staff have determined that there should be a high priority placed on disposing of dredged sandy material upland. At a minimum, incentives should be developed to limit disposal of any such material with a market value to upland uses. Staff may condition certifications so as to encourage upland reuse of high value sediments.

10. POLICY ON DREDGED MATERIAL DISPOSAL PERMIT COORDINATION

The Regional Board will implement these measures through its issuance of waste discharge requirements, water quality certification under Section 401 of the Clean Water Act, or other orders. In addition, the Regional Board may require pre- and post-dredge surveys to determine disposal volumes and compliance with permit conditions. In order to better manage data and reduce paper files, Regional Board staff may request, but not require, that applicants submit testing and other project data in a specific electronic format. The Regional Board has been an active participant in efforts to improve the overall dredging permit process and procedures. The goal of this effort is to provide the public with uniform testing and disposal guidelines, joint permit actions, a streamlined permit application process, and more uniform permit enforcement. Staff are working with other state and federal agencies to implement a combined state-federal dredging permit process. The process is generally based on the Washington State "Dredged Material Management Office," a part of the Puget Sound Dredged Disposal Analysis program (PSDDA), which regulates dredging and disposal in the Seattle and Tacoma regions.

MINES AND MINERAL PRODUCERS

INACTIVE SITES

Over 50 abandoned or inactive mines have been identified within the San Francisco Bay region (Table 4-16 and Figure 4-5). The mineral resources extracted include mercury, magnesite, manganese, coal, copper, silver, and gold. A large percentage of the mining activities took place from 1890-1930, although some areas were mined as recently as 1971. The sizes of these mines vary from relatively small surface mines of less than half an acre to the world's second largest mercury mine, the New Almaden District, located in southern Santa Clara County.

Water quality problems associated with mining activities can be divided into two categories:

- Erosion and sediment discharge from surface mines and ore tailings piles; and
- Acid or otherwise toxic aqueous discharge from underground mines, ore tailings, or other mining processes.

Problems of erosion and sediment discharged from mined areas may be intensified due to the fact that sediment from ore-rich areas typically contains high concentrations of metals. Biological processes that take place in lake and stream-bottom sediments may allow these pollutants to be released in a form that more readily bioaccummulates in the food chain.

Recent water quality and aquatic toxicity monitoring data suggest that the beneficial uses of a number of water supply reservoirs, creeks, and streams in the region have been impacted as a result of past mining activities. Threatened beneficial uses of lakes, streams, bays, and marshes due to mining activities so

far identified in the region include fish migration, fish spawning, shellfish harvesting, wildlife habitat, preservation of rare and endangered species, freshwater fisheries habitat, and water contact recreation. In response to these findings, surveys were conducted by Regional Board staff in order to locate all abandoned and operating mines in the region.

In many cases, the adverse results of previous surface mining activities can be reduced, and in some cases eliminated, through appropriate erosion and sediment control practices. The U.S. Natural Resource Conservation Service (NRCS, formerly Soil Conservation Service) has developed a Resource Management System for Surface Mined Areas. This management system references practices and treatment alternatives needed in order to address the following:

- Erosion control practices that will dispose of surface water runoff at non-erosive velocities and reduce soil movement by wind or water to within acceptable limits;
- Maintenance of adequate water quality and quantity for planned uses and to meet federal, state, and local requirements;
- Pollution control to meet federal, state, and local regulations; and
- A system of planned access and/or conveyance that is within local regulations and meets the needs for the intended use.

In 1980, a memorandum of understanding was negotiated with the Council of Bay Area Resource Conservation Districts in order to provide for assessment and monitoring of potential and existing soil erosion-related water quality problems and identification of control measures. It was agreed that local units of government should have the lead role in controlling land-use activities that cause erosion. Control measures include the implementation of best management practices (BMPs). The Resource Management System for Surface Mined Areas developed by NRCS specifically references BMPs determined to be the most effective and practicable means of preventing or reducing erosion- and sediment-related water quality degradation resulting from surface mining activities.

ACTIVE SITES

There are approximately 100 active mines and mineral producers within the San Francisco Bay region. The primary mineral commodities produced include clay, salt, sand and gravel, shale, and crushed stone. Water quality problems associated with mineral production activities generally consist of erosion and sediment discharge into nearby surface water bodies and wildlife habitat destruction.

Active mining and mineral production activities are in part regulated under the Surface Mining and Reclamation Act of 1975. This act requires all mine operators to submit a reclamation plan to the California Department of Conservation, Division of Mines and Geology, and the recognized lead local agency for the area in which the mining is taking place. Recognized lead local agencies for the San Francisco Bay region include county planning and public works departments. Additionally, some local planning departments regulate mining activities through the issuance of conditional land-use permits. The goal of each reclamation plan is to assure that mined lands are reclaimed to a usable condition that is readily adaptable for alternate land uses and creates no danger to public health and safety. To date, very little emphasis has been placed on the need to protect beneficial uses of surface and groundwaters in the established permitting process.

Under the California Code of Regulations, Title 23, Chapter 15, Article 7, the Regional Board has the authority to regulate mining activities that result in a waste discharge to land through the use of waste discharge requirements. Additionally, the federal NPDES stormwater regulations (40CFR Parts 122, 123, and 124) require active and inactive mining operations to obtain NPDES permit coverage for the discharge of stormwater contaminated by contact with any overburden, raw material, intermediate products, finished products, byproducts, or waste products.

GOAL

The Regional Board's goal is to restore and protect beneficial uses of receiving waters now impaired or threatened with impairment resulting from past or present mining activities.

This goal will be attained by the coordinated effort of the Regional Board, NRCS, the Council of Bay Area Resource Conservation Districts, the California Division of Mines and Geology, and lead local government agencies through the implementation of a mineral production and mining management program.

PROGRAM

1. The Regional Board intends to continue to work closely with Resource Conservation Districts and NRCS to identify all existing and abandoned mines and mineral production sites in the region. Responsible

parties will be identified, as well as potential funding alternatives for clean-up activities, if needed. Sites will be prioritized based on existing and potential impacts to water quality and size.

2. The Regional Board will require an NPDES permit for the discharge of contaminated stormwater from active and inactive mining operations, as defined in the NPDES stormwater regulations. The Regional Board will consider issuing individual permits or a general permit for such discharges, or will otherwise allow coverage under the State Board general permit for stormwater discharges associated with industrial activity as described in the "Urban Runoff Management, Industrial Activity Control Program" section. Requirements of the notice of intent to be covered under the general permit(s) and the schedule for submittal will be established in the permit(s).

3. The responsible party or operator of each site discharging or potentially discharging waste to land shall be required to submit a Report of Waste Discharge to the Regional Board, pursuant to the California Water Code Section 13267. Requests will be made on a site-by-site basis and based on priority. A Report of Waste Discharge shall consist of a "Site Closure Plan" and an "Operation and Management Plan" for active sites.

   - Each plan shall be designed to ensure short- and long-term protection of beneficial uses of receiving waters.
   - The "Closure Plan" shall address site restoration and long-term maintenance and monitoring.
   - The "Management Plan" shall address stormwater runoff and erosion control measures and practices.
   - Each plan will be evaluated in regard to potential impacts to beneficial uses of receiving waters. Waste Discharge Requirements will be issued or waived at the discretion of the Regional Board based on the threat to water quality and the effectiveness of identified and implemented control measures and the effectiveness of local agency oversight.

VESSEL WASTES

The discharge of wastes from pleasure, commercial, and military vessels has been a water quality concern of the Regional Board since 1968 when Resolution No. 665 was adopted, which suggested that the federal government regulate waste discharges from vessels. In 1970, the Regional Board adopted Resolutions 70-1 and 70-65 on vessel wastes. The first urged BCDC to condition marina permits for new or expanded marinas to include pumpout facilities, dockside sewers, and restroom facilities. Resolution 70-65 recommended that vessel wastes be controlled in such a manner through legislative action.

In 1982, the Regional Board conducted a study that found high levels of coliform in the vicinity of several marinas in Marin County's Richardson Bay. Subsequently, the Regional Board adopted a prohibition against discharge of any kind into Richardson Bay. A regional agency was formed to implement and enforce this prohibition.

There is an ongoing effort to construct, renovate, and improve pumpout facilities at marinas and ports around the region. The goal of these efforts is to increase the accessibility of these facilities to boaters and reduce pollution from vessel wastes.

WETLANDS PROTECTION AND MANAGEMENT

Wetlands and related habitats comprise some of the San Francisco Bay region's most valuable natural resources. Wetlands provide critical habitats for hundreds of species of fish, birds, and other wildlife; offer open space; and provide many recreational opportunities. Wetlands also enhance water quality through such natural functions as flood and erosion control, stream bank stabilization, and filtration and purification of naturally occurring contaminants.

The Regional Board will refer to the following for guidance when permitting or otherwise acting on wetlands issues:

- Governor's Executive Order W-59-93 (signed August 23, 1993; also known as the California Wetlands Conservation Policy);
- Senate Concurrent Resolution No. 28; and
- California Water Code Section 13142.5 (applies to coastal marine wetlands).

The goals of the California Wetlands Conservation Policy include ensuring "no overall net loss," achieving a "long-term net gain in the quantity, quality, and permanence of wetlands acreage and values ...", and reducing "procedural complexity in the administra-

tion of state and federal wetlands conservation programs."

Senate Concurrent Resolution No. 28 states, "It is the intent of the legislature to preserve, protect, restore, and enhance California's wetlands and the multiple resources which depend on them for the benefit of the people of the state."

California Water Code Section 13142.5 states, "Highest priority shall be given to improving or eliminating discharges that adversely affect ... wetlands, estuaries, and other biologically sensitive sites."

The Regional Board may also refer to the San Francisco Estuary Project's *Comprehensive Conservation and Management Plan* (June, 1994) for recommendations on how to effectively participate in a regionwide, multiple-agency wetlands management program.

REGIONAL WETLANDS MANAGEMENT PLAN

Consistent with the California Wetlands Conservation Policy, the Regional Board is participating in the preparation of a Regional Wetlands Management Plan (RWMP). The RWMP will provide the framework for coordinating and integrating wetlands planning and regulatory activities in the San Francisco Bay region and will therefore include both regulatory and non-regulatory components. The RWMP will identify and specify the beneficial uses and/or functions and values of existing wetlands and establish wetland habitat goals for the region. As beneficial uses are identified for specific wetlands, the Basin Plan will be amended to incorporate the new information into Chapter 2.

The RWMP will also seek to streamline the wetlands regulatory process through improved interagency coordination and consolidation of the permitting process. Towards this end, the Regional Board has undertaken the 404/Regulatory Pilot Project, which will be discussed in more detail under "Emerging Program Areas."

DETERMINATION OF APPLICABLE BENEFICIAL USES FOR WETLANDS

Beneficial uses of water are defined in Chapter 2 and are applicable throughout the region. Chapter 2 also identifies and specifies the beneficial uses of 34 significant marshes within the region. The Regional Wetlands Management Plan will identify and specify the beneficial uses of many additional significant wetlands. However, because of the large number of small and non-contiguous wetlands within the region, it will probably not be practicable to specify beneficial uses for every wetland area. Therefore, beneficial uses will frequently be specified as needed for a particular site. This section provides guidance on how beneficial uses will be determined for wetlands within the region.

General information contained in U.S. Fish & Wildlife Service maps regarding the location and areal extent of different wetland types will be used as an initial reference for any necessary delineation and beneficial use designation. The Regional Board will then use the Fish & Wildlife Service's *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, et.al. 1979), which is incorporated by reference into this plan, or other appropriate methods to identify specific wetland systems at specific locations. A matrix of the potential beneficial uses that may be supported by each Fish & Wildlife wetland system type is presented in Table 4-17.

It should be noted that while the Fish & Wildlife wetlands classification system is a useful tool for helping to establish beneficial uses for a wetland site, it is not suggested that this system be used to identify or delineate wetlands.

HYDROLOGY

Hydrology is a major factor affecting the beneficial uses of wetlands. To protect the beneficial uses and water quality of wetlands from impacts due to hydrologic modifications, the Regional Board will carefully review proposed water diversions and transfers (including groundwater pumping proposals) and require or recommend control measures and/or mitigation as necessary and applicable.

WETLAND FILL

The beneficial uses of wetlands are frequently affected by diking and filling. Pursuant to Section 404 of the Clean Water Act, discharge of fill material to waters of the United States must be performed in conformance with a permit obtained from the Army Corps of Engineers prior to commencement of the fill activity. Under Section 401 of the Clean Water Act, the state must certify that any Section 404 permit issued by the Corps will comply with water quality standards established by the state (i.e., Basin Plans), or the state can waive such certification. If the state does not waive certification, the State Board's Executive Director, acting on the recommendation of the Regional Board, can grant or deny state certification.

C-107573

The Regional Board has independent authority under the State Water Code to regulate discharges of waste to wetlands (waters of the state) that would adversely affect the beneficial uses of those wetlands through waste discharge requirements or other orders. In situations where there is a conflict between the state and the Corps, such as over a jurisdictional determination or in rare instances where the Corps may not have jurisdiction, the Regional Board may choose to exercise its independent authority under the State Water Code. In such cases, the dischargers and/or affected parties will be notified within 60 days of the Regional Board's decision and be required to file a report of waste discharge.

For proposed fill activities deemed to require mitigation, the Regional Board will require the applicant to locate the mitigation project within the same section of the region, wherever possible. The Regional Board will evaluate both the project and the proposed mitigation together to ensure that there will be no net loss of wetland acreage and no net loss of wetland value. "Out-of-kind" mitigation may be permitted in situations where it is consistent with the goals of the Regional Wetlands Management Plan.

The Regional Board will use U.S. EPA's Section 404(b)(1), "Guidelines for Specification of Disposal Sites for Dredge or Fill Material," dated December 24, 1980, which is incorporated by reference into this plan, in determining the circumstances under which wetlands filling may be permitted.

In general, it is preferable to avoid wetland disturbance. When this is not possible, disturbance should be minimized. Mitigation for lost wetland acreage and values through wetlands restoration or creation should only be considered after disturbance has been minimized.

OIL SPILLS

Oil spills can cause severe and extensive damage to the environment. Fortunately, the petroleum industry has been improving its safety record in oil transfer operations—the step in petroleum handling where spills are most likely to occur. The volume of oil spilled during transfer operations has decreased since 1975.

This improvement is due to:

- U.S. Coast Guard regulations for oil transfer operations;
- State Lands Commission guidelines for petroleum facility operations manuals;
- High clean-up costs and public concern associated with oil spills; and
- Regional Board, California Department of Fish and Game, and U.S. Coast Guard enforcement actions against parties responsible for spills.

The Regional Board considered adopting a policy requiring specific improvements in oil transfer operations. However, due to the industry's improved performance, the Regional Board is holding the adoption of such a policy in abeyance while continuing to monitor the industry's performance. The Regional Board recognizes that additional regulation is unnecessary if the petroleum industry maintains its improved record.

GROUNDWATER PROTECTION AND MANAGEMENT

Per Regional Board Resolution No. 89-39, which is incorporated by reference into this plan, almost all the region's groundwaters are considered to be existing or potential sources of drinking water. With limited resources, the Regional Board must concentrate its groundwater protection and management efforts on the most important groundwater basins. The Department of Water Resources (DWR) has identified 31 individual groundwater basins in the San Francisco Bay Region that serve or could serve as sources of high quality drinking water.

Increased demands on these groundwater resources have become evident in the rapidly developing Bay Area. Years of drought and a decade of discoveries of groundwater pollution have resulted in impacts or impairment to portions of these basins. Some municipal, domestic, industrial, and agricultural supply wells have been taken out of service due to the presence of pollution. Some of the basins have also been affected by over-pumping, resulting in land subsidence and saltwater intrusion.

Such pressures on groundwater resources require that comprehensive environmental planning and management practices be developed and implemented for each individual basin by all concerned and affected parties. The Regional Board will foster this concept with the following groundwater protection and management goals for the San Francisco Bay region.

GROUNDWATER PROGRAM GOALS

1) Identify and update beneficial uses and water quality objectives for each groundwater basin.

Water quality objectives must maintain the existing high quality of groundwater and protect its beneficial uses. The Regional Board's program to identify and update objectives is described below under "Application of Water Quality Objectives."

2) Regulate activities that impact or have the potential to impact the beneficial uses of groundwaters of the region.

Federal, state, and local groundwater protection and remediation programs that will result in the overall maintenance or improvement of groundwater quality must be implemented regionwide in a consistent manner. When a potential threat or problem is discovered, containment and clean-up efforts must be undertaken as quickly as possible to limit groundwater pollution. Where activities that could affect the beneficial uses of groundwater are not regulated by other federal, state, or local programs, the Regional Board will consider regulation depending on the threat to beneficial uses and availability of Regional Board resources. The Regional Board's program for hazardous and nonhazardous waste disposal, shallow drainage wells, and cleanup of polluted sites is described below under "Regulation of Potential Pollution Sources."

3) Prevent future impacts to the groundwater resource through local and regional planning, management, and education.

Groundwater is an integral component of a watershed's hydrologic system. A comprehensive watershed management approach is necessary to protect groundwater resources. The Regional Board's program for broadening its information base on groundwater resources and individual protection needs of basins is described below under "Groundwater Protection Program."

APPLICATION OF WATER QUALITY OBJECTIVES

Water quality objectives apply to all groundwaters, rather than at a wellhead or at a point of consumption. Maintaining the existing high quality of groundwater (i.e., "background") is the primary objective, which defines the lowest concentration limit that the Regional Board requires for groundwater protection. The Regional Board also has narrative and numerical water quality objectives for bacteria, chemical constituents, radioactivity, and taste and odor (see Chapter 3). These objectives define the upper concentration limit that the Regional Board considers protective of beneficial uses. The lower and upper concentration limits define the range that the Regional Board considers for clean-up levels of polluted groundwater. Establishment of clean-up levels is discussed below under "Cleanup of Polluted Sites."

Numerical limits that implement all applicable water quality objectives, including Maximum Contaminant Levels (MCLs) and Secondary Maximum Contaminant Levels (SMCLs), are only acceptable as the upper end of a concentration range to protect the

beneficial uses of municipal and domestic drinking water sources. Such numerical limits are appropriate only at the upper end, as some are set after technical feasibility and treatment costs are considered, leave no margin for future spills, and do not account for the combined risks that exist when many chemicals are present.

Ideally, the Regional Board would establish numerical groundwater objectives for all constituents. However, the Regional Board is limited in its ability and resources to independently establish numerical objectives for groundwater. To evaluate compliance with water quality objectives, the Regional Board will consider all relevant and scientifically valid evidence, including relevant and scientifically valid numerical criteria and guidelines developed and/or published by other agencies and organizations (e.g., State Water Board, U.S. EPA, California Department of Health Services, Cal/EPA's Office of Environmental Health Hazard Assessment, Cal/EPA's Department of Toxic Substances Control, etc.) to provide the numerical criteria for Regional Board consideration as groundwater objectives. To assist dischargers and other interested parties, the Central Valley Regional Board's staff has compiled many numerical water quality criteria from other appropriate agencies and organizations in its staff report, "A Compilation of Water Quality Goals." This staff report is updated regularly to reflect changes in these numerical criteria.

In practice, the Regional Board uses water quality objectives for groundwater somewhat differently from those for surface water. For groundwater, the Regional Board's emphasis is the regulation of sites where objectives are not being met, cleanup is required and/or underway, and no further waste discharges will be allowed in the future. In contrast, surface water discharges regulated by the Regional Board are usually for ongoing discharges regulated to meet water quality objectives in receiving waters.

In the typical situation, the Regional Board must identify and establish site- and basin-specific groundwater beneficial uses and standards for the cleanup of groundwater polluted by the numerous and extensive spills and leaks of toxic chemicals (e.g., organic solvents, fuels, metals, etc.).

Very few waste discharges to land are allowed by the Regional Board, and those that are permitted (e.g., landfills, industrial waste disposal, above-ground soil treatment, etc.) are closely regulated under the requirements of existing laws and regulations in order to maintain and protect groundwater quality objectives. An additional category of discharges to land is the numerous individual domestic waste disposal systems (e.g., septic systems) that are permitted and regulated by the counties. The Regional Board waives regulation based upon the fact that the counties' regulation of the systems complies with applicable Regional Board requirements.

Groundwater objectives for individual basins may be developed in the future. As the Regional Board completes projects that provide more detailed delineation of beneficial uses within basins, revised objectives may be developed for portions of groundwater basins that have unique protection needs. One such project is described below under "Groundwater Protection Programs."

REGULATION OF POTENTIAL POLLUTION SOURCES

SHALLOW DRAINAGE WELLS

INTRODUCTION

The California Water Code, Section 13710, defines the term "well" or "water well" to mean any artificial excavation constructed by any method for the purpose of extracting water from or injecting water into the underground. The definition does not include (a) oil, gas, and geothermal wells, or (b) construction dewatering wells and hillside stabilization dewatering wells. Therefore, all shallow drainage wells (also known as dry wells, infiltration basins, and shallow injection wells) used for the purpose of disposing of stormwater or surface runoff are covered under this definition. The purpose of this Basin Plan section is to clarify the Regional Board's position in regard to the construction, usage, and regulatory permitting aspects of shallow drainage wells.

BACKGROUND

In 1951, the Regional Board adopted Resolution No. 81, "Statement of Policy on Sewer and Drainage Wells," which is incorporated by reference into this plan. This resolution states that the Regional Board disapproves of the construction and use of wells for disposal of effluent from septic tanks and surface runoff from streets and highways except where such wells discharge into a formation that at no time will contain groundwater fit for domestic, agricultural, or industrial use. At the same time, the Regional Board recognized that

these wells already existed in the region and that immediate abandonment may be impractical. Therefore no new installations were to be permitted, more satisfactory drainage methods were to be substituted for existing installations at the earliest practicable date, and the Regional Board was to consider the matter of prescribing requirements for the discharge in granting any exceptions to the prohibition. After review of Regional Board files, it does not appear that any exceptions to the resolution were officially granted.

An "Explanation of Policy" was adopted with the resolution. The reasons for concern over the continuation of such practices can be summarized as follows:

(A) Wells used to dispose of sewage and surface drainage bypass the normal processes of nature that occur at or near the surface of the soil. The use of such wells may allow for injection of waste into subsurface strata rapidly and unchanged in chemical quality.

(B) It is not practical to control the quality of water entering these wells to the degree needed to protect beneficial uses. The only practical method of controlling groundwater pollution is prevention. Groundwater pollution is not usually noticed until the damage is done, and rapid abatement is impractical.

(C) Relatively small quantities of pollutants may be introduced over a long period of time and eventually cause cumulative damage of large proportions.

Board staff in cooperation with U.S. EPA recently surveyed municipalities and a number of industries to determine the usage of shallow drainage wells in the region. Results indicate that shallow drainage wells have been haphazardly installed throughout the region, use of the wells is prevalent, and construction and usage has gone virtually unregulated. Additionally, shallow drainage wells are still being constructed in new residential and industrial developments.

U.S. EPA has investigated numerous cases nationwide in which the use of shallow drainage wells impacted drinking water supplies. Within the San Francisco Bay region, a number of groundwater investigations revealed stormwater drainage wells as possible sources of pollutants. While it was not possible to determine if the pollutants detected in groundwater originated from the identified wells, it was determined that current practices associated with these wells posed a serious threat to groundwater supplies.

Shallow drainage wells concentrate runoff and allow for its rapid infiltration to the subsurface. In turn, the buffering capacity of soils for removing pollutants and protecting groundwater supplies is reduced. The threat a shallow drainage well may pose to groundwater is directly related to the quality of the water entering the well, along with its location and design. The location of the well must be taken into consideration. Subsurface conditions, such as the permeability of underlying soils and the depth to groundwater, vary considerably throughout the region. In this regard, design is also important, as deeper wells may penetrate confining or semi-confining clay layers and serve as conduits for pollutants to migrate to lower aquifers. Managing surrounding land uses is one means of controlling the quality of water entering the well. For instance, wells should be labeled and not used in areas where there is a high probability of a highway accident or spill, and not located in certain industrial areas. With proper management, placement, and design, shallow drainage wells can have a positive environmental benefit, as there is a need to allow stormwater to recharge shallow groundwater and to protect surface water from excessive sedimentation and other water quality problems associated with high stormwater discharge flows.

The Federal Underground Injection Control Program was established in 1984 with the adoption of the Safe Drinking Water Act. In California, U.S. EPA is the lead agency in charge of administering the program. Under this program, wells used to dispose of surface water runoff are classified as Class V injection wells. The owner or operator of any existing Class V well is required to submit information on each well, including the nature and type of discharge and operating status. For the San Francisco Bay region, no voluntary reports of the existence of Class V wells were received by U.S. EPA as required under these regulations.

There are a number of applicable state regulations pertaining to the construction and use of shallow drainage wells. AB2182 (Ch. 1131, Sec. 4458) of the California Health and Safety Code, passed in 1961, prohibits the use of drainage wells for the disposal of sewer water unless authorized by the Regional Board. The California Water Code (Ch. 10, Secs. 13700 - 13806) defines the terms "well" and "water well" and states that any person who intends to dig, bore, or drill such a well must file a notice of intent with the California Department of Water Resources (DWR) or the designated local enforcement agency. A detailed

report of completion must then be filed after construction. If the Regional Board finds that standards of water well construction, maintenance, abandonment, and destruction are needed in any area to protect beneficial uses of groundwater, it shall determine the area to be involved and so report to each affected county and city in the area. Each such affected county shall, within 120 days of receipt of the report, adopt an ordinance establishing standards of water well construction, maintenance, abandonment, and destruction for the designated area. To date, standards and siting criteria for shallow drainage wells are nonexistent in this region and subsequently not included in the well-permitting process.

The Regional Board is now issuing NPDES permits for stormwater discharges to surface water for certain industrial and construction activities and to the larger municipalities in the region. The permits require the implementation of control measures to reduce pollutant loading, along with water quality monitoring to assure that the waters being discharged will not impact the beneficial uses of receiving waters. The discharge of industrial waste into the sanitary sewer system is now closely regulated under a pretreatment program. Likewise, the discharge of stormwater to the subsurface must also be regulated to assure the protection of groundwater supplies. Standards for shallow drainage well construction, maintenance, abandonment, destruction and siting criteria are needed throughout the region. Land-use decisions, such as stormwater structural controls and well-construction permitting, are most often made by local government agencies, including water districts and planning and building departments. Many of these agencies are not aware of the Regional Board's Resolution No. 81, or the rationale behind it.

In summary, the rationale for adopting Resolution No. 81 in 1951 is still very much applicable today. The only practical method of controlling groundwater pollution is prevention, since groundwater pollution is not usually noticed until the damage is done.

GOAL

The goal of the Shallow Drainage Program is to eliminate the unregulated construction and use of shallow drainage wells in areas where municipal, domestic, agricultural, and industrial groundwater supplies are threatened.

This goal is to be attained by a coordinated effort on the part of U.S. EPA, the Regional Board, DWR, and local government agencies to implement a shallow drainage well control program.

PROGRAM

The Regional Board prohibits the unauthorized construction and use of shallow drainage wells. The shallow drainage well control program shall consist of two main elements: 1) locating existing wells; and 2) regulating the construction and use of existing and new wells.

1. Locating existing wells

   U.S. EPA, the Regional Board, and local government agencies will need to work together to identify all existing shallow drainage wells.

2. Regulating existing wells and new wells

   Continued use of existing wells or construction of new wells may be authorized by a local enforcing agency through its well-permitting process. The Regional Board will work with DWR and each city, county, and local water supply and flood control agency on developing standards for adoption by ordinance for the construction, maintenance, abandonment, and destruction of shallow drainage wells. Additionally, it must be demonstrated that the use of the well will not result in a discharge that may pose a threat to municipal, domestic, agricultural, and industrial groundwater supplies. If this cannot be adequately demonstrated, the well must be permanently closed. Closure of each well must be done in compliance with U.S. EPA Class V injection well closure guidelines and applicable local agency guidelines or regulations.

HAZARDOUS AND NONHAZARDOUS WASTE DISPOSAL

Discharges of solid, semisolid, and liquid wastes to landfills, waste piles, surface impoundments, and land treatment facilities can create sources of pollution affecting the quality of waters of the state. Waste discharges can be assimilated by receiving waters, if the concentration of pollutants in the waste is regulated (i.e., treated wastewater from municipal or industrial facilities). Conversely, discharges of wastes to waste management units require long-term containment or active treatment following the discharge in order to prevent waste or waste constituents from migrating to and impairing the beneficial uses of waters of the state.

Pollutants from such discharges may continue to affect water quality long after the discharger has stopped discharging new wastes at a site, either because of continued discharges from the site or because pollutants from the site have accumulated in underlying soils and are migrating to groundwater.

Landfills for disposal of municipal or industrial solid waste (solid waste disposal sites) are the major categories of waste management units in the region. But there are also surface impoundments used for storage or evaporative treatment of liquid wastes, waste piles, and land treatment facilities where semi-solid sludge from wastewater treatment facilities and liquid wastes from refinery operations are discharged for biological treatment. The Regional Board issues waste discharge requirements to ensure that these discharges are properly contained to protect the region's water resources from degradation and to ensure that the dischargers undertake effective monitoring to verify continued compliance with requirements.

These discharges, and the waste management units at which the wastes are discharged, are subject to concurrent regulation by other state and local agencies responsible for land-use planning, solid waste management, and hazardous waste management. Local enforcement agencies implement both the state's solid waste management laws and local ordinances governing the siting, design, and operation of solid waste disposal facilities (usually landfills) with the concurrence of the California Integrated Waste Management Board. The Waste Management Board also has direct responsibility for review and approval of plans for closure and post-closure maintenance of solid waste landfills. The Department of Toxic Substance Control (DTSC) issues permits for all hazardous waste management treatment, storage, and disposal facilities (which include incinerators, tanks, and warehouses where hazardous wastes are stored in drums, as well as landfills, waste piles, and surface impoundments).

The State Water Board, Regional Boards, the Waste Management Board, and DTSC have entered into a Memorandum of Understanding to coordinate their respective roles in the concurrent regulation of these discharges.

The Regional Board regulates landfills receiving municipal solid wastes and facilities receiving industrial wastes of various types. Figure 4-6 shows the municipal solid waste landfill sites within the region. These sites are closely regulated and monitored, but some water quality problems have been detected and are being addressed. As a result of federal laws in the area of hazardous waste regulation, more effort is being devoted to regulation of facilities for the on-site treatment, storage, and disposal of hazardous waste. These are facilities where the discharges are from entities that generate the waste and where only those wastes generated by the entities are disposed.

The laws and regulations governing the discharges of both hazardous and non-hazardous solid wastes have been revised and strengthened in the last few years. Implementation of the following programs is described below: California Code of Regulations (CCR) Title 23, Chapter 15; Resource Conservation and Recovery Act; Toxic Pits Cleanup Act; and Solid Waste Assessment Tests. The Regional Board's policies on two significant areas of regulatory concern with respect to landfills — "Landfill Expansions" and "Bayfront Landfill Expansion into Wetlands" — are also included below.

CCR TITLE 23, CHAPTER 15

The most significant regulation used by the Regional Board in regulating hazardous and non-hazardous waste treatment, storage, and disposal is CCR Title 23, Division 3, Chapter 15, formerly Subchapter 15. Chapter 15 includes very specific siting, construction, monitoring, and closure requirements for all existing and new waste treatment, storage, and disposal facilities. Chapter 15 also contains a provision requiring operators to provide assurances of financial responsibility for initiating and completing corrective action for all known or reasonably foreseeable releases from their waste management units. Detailed technical criteria are provided for establishing water quality protection standards, monitoring programs, and corrective action programs for releases from waste management units. Chapter 15 required the review and update of waste discharge requirements for all hazardous waste treatment, storage, and disposal sites by January 1, 1993, and for all non-hazardous waste treatment, storage, and disposal sites by July 1, 1994.

Chapter 15 defines waste types to include hazardous wastes, designated wastes, non-hazardous solid wastes, and inert waste. Hazardous wastes are defined by DTSC in CCR Title 22. Designated wastes are defined as:

1) Those non-hazardous wastes that consist of or contain pollutants that under ambient conditions at the waste management unit could be released at concentrations in excess of water quality objectives; or

2) Hazardous wastes pursuant to CCR Title 22, which are not considered hazardous by the federal Resource Conservation and Recovery Act (RCRA) definition, that have been granted a variance from hazardous waste management requirements by DTSC.

Non-hazardous solid wastes are those normally associated with domestic and commercial activities. Non-hazardous solid wastes and inert wastes can be regulated by the Regional Board if necessary to protect water quality.

The Regional Board's regulation of non-hazardous solid waste facilities (Class III) has been on-going since the mid-1970s, and in some instances since the early 1950s. Many of the small, older facilities have closed, and waste is now being disposed of at large regional non-hazardous solid waste facilities. At non-hazardous solid waste facilities, the Regional Board reviews and revises waste discharge requirements for active sites to assure consistency with current regulations. These actions include defining the levels of designated wastes (see below), upgrading groundwater monitoring systems to identify whether water quality objectives are being violated, establishing corrective action programs where standards are violated, and reviewing and overseeing the development and implementation of facility closure plans.

To implement Chapter 15 at non-hazardous solid waste facilities, the Regional Board must define designated wastes. Many wastes that are not hazardous still contain constituents of water quality concern that could become soluble in a non-hazardous solid waste facility and produce leachates and gases that could pose a threat to beneficial uses of state waters.

The criteria for determining whether a non-hazardous waste is a designated waste are based on water quality objectives in the vicinity of the site, the containment features of the solid waste facility, and the solubility/mobility of the waste constituents. Therefore, all owners and operators of active non-hazardous municipal solid waste facilities in the San Francisco Bay region who wish to receive wastes other than municipal solid waste or inert wastes must propose waste constituent concentration criteria above which wastes will be considered designated waste and therefore, not suitable for disposal at their site. Such proposals are subject to approval by the Executive Officer when appropriately delegated by the Regional Board. In determining whether a non-hazardous waste is a designated waste, the Regional Board will consider all relevant and scientifically valid evidence, including relevant and scientifically valid numerical criteria and guidelines developed and/or published by other sources, such as the Central Valley Regional Board's staff report, "Designated Level Methodology for Waste Classification and Clean-up Level Determination," or an equivalent methodology acceptable to the Executive Officer.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

The state implements the Resource Conservation and Recovery Act's Subtitle C — Hazardous Waste Regulations for Treatment, Storage, and Disposal — through DTSC and the Regional Boards. In August, 1992, U.S. EPA formally delegated RCRA Subtitle C program implementation authority to DTSC. As described above, regulation of hazardous waste discharges is also included in CCR Title 23, Chapter 15. Chapter 15's monitoring requirements were amended in 1991 to be equivalent to RCRA requirements. These will be implemented through the adoption of waste discharge requirements for hazardous waste sites covered by RCRA. The discharge requirements will then become part of a state RCRA permit issued by DTSC.

Federal regulations required by RCRA's Subtitle D have been adopted for municipal solid waste landfills (40 CFR 257 & 258). These regulations are self-implementing, with portions effective October, 1991; October, 1993; and later. The Waste Management Board is the state lead agency for Subtitle D implementation and has been delegated authority to implement the program by U.S. EPA.

TOXIC PITS CLEANUP ACT

The Toxic Pits Cleanup Act of 1984 (TPCA) required that all impoundments containing liquid hazardous wastes or free liquids containing hazardous waste be retrofitted with a liner/leachate collection system or dried out by July 1, 1988, and subsequently closed in accordance with Chapter 15, Title 22, and RCRA regulations. In 1985, there were 26 sites in the region with ponds subject to the act. As of 1994, one site was continuing to operate its facility under the act's exemption requirements. Of the remaining sites, 19 have closed, and the remainder have been delayed in closure either by complications in the federal/DTSC RCRA closure process, or by the Regional Board's decision to delay closure to allow for gradual removal and reuse of materials in the ponds. All these sites are expected to close by 1995.

SOLID WASTE ASSESSMENT TESTS

Section 13273, added to the State Water Code in 1985, requires all owners of both active and inactive landfills to complete a Solid Waste Assessment Test (SWAT) to determine if hazardous wastes have migrated from the landfill. There were 195 sites identified in the region subject to this program. Pursuant to a ranked list adopted by the State Board, 150 site owners statewide per year would complete this evaluation, continuing to the year 2001. All sites eventually will be required to complete a SWAT unless waived or exempted in accordance with the law. Program funding was eliminated in 1991 and restored in 1992 solely for the review of backlogged SWAT documents submitted for sites in the first five ranks. SWAT reports from ranks six and above are currently reviewed only for sites under regulation by other Regional Board programs, thus significantly delaying completion of the SWAT program. More sites will be reviewed if more program funding becomes available, as is expected.

LANDFILL EXPANSIONS

The rate of solid waste generation in the region has increased. As a result, some existing disposal sites are filling up and need to be either closed or expanded, and new sites will need to be created. The Regional Board strongly discourages locating new landfills or expanding existing facilities in sensitive groundwater areas. To minimize the problems associated with the disposal of solid wastes, the Regional Board supports the vigorous implementation of the requirement for a 50 percent reduction in the total quantity of waste disposal by the year 2000 as called for in AB 939. Designated wastes should be precluded from Class III landfills through local checking programs, recycling, and diversion. To reduce the potential for household hazardous wastes entering municipal landfills, the Regional Board supports local programs for public education and for household hazardous waste disposal and recycling.

BAYFRONT LANDFILL EXPANSIONS INTO WETLANDS

A significant issue that the Regional Board has addressed is the expansion of existing Bayfront landfills into wetland areas. The Regional Board, in a few cases, allowed modest expansions (and undesirable loss of wetlands) to allow local governments time to develop other disposal options. However, these expansions were only approved because there was a demonstrated immediate public need. One expansion permit was appealed to the State Board, which clearly indicated that future such expansions into wetlands would not be given the same approvals and that local governments must complete the necessary planning to avoid this problem. Given the State Board's position and the wetlands provisions contained elsewhere in this Basin Plan, the Regional Board will not approve further expansions of Bayfront landfills into wetlands.

CLEANUP OF POLLUTED SITES

The Regional Board has identified over 5,400 sites with confirmed releases of constituents of concern that have polluted or threaten to pollute groundwater. Sources of pollution at these sites include leaking underground storage tanks and sumps; leaking aboveground tanks; leaking pipelines; surface spills from chemical handling, transfer or storage; poor housekeeping; and illegal disposal.

The Regional Board's strategies for managing polluted sites are discussed below under the following five sections:

(1) Program areas;

(2) Requirements for site investigation and remediation;

(3) Progress of the Regional Board's program;

(4) Setting clean-up levels; and

(5) Future regulatory management strategies.

Several important Regional Board policies are detailed in these five sections. Summaries of pertinent policies are provided below.

- The Regional Board will follow procedures and policies in State Board Resolution No. 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code 13304," regardless of the type of discharge. (See the "Requirements for Site Investigation and Remediation" section below.)
- Groundwater and soil clean-up levels are approved by the Regional Board. The Executive Officer or a local agency may approve clean-up levels as appropriately established by the Regional Board. (See the following section "Setting Clean-up Levels.")

- Groundwater clean-up levels are established based on beneficial uses of the water body and water quality objectives outlined in Chapter 3. The concentration range for clean-up levels is high quality "background" or between "background" and numerical limits that implement all applicable water quality objectives, including the more restrictive of Maximum or Secondary Maximum Contaminant Levels for groundwaters with a beneficial use of municipal and domestic supply. These numerical limits (e.g., MCLs or SMCLs) will only be considered worst-case, upper-concentration limits, as they may not provide adequate public health protection in the instance of exposure to multiple chemicals. (See the "Setting Clean-up Levels" section below.)
- The Regional Board will use risk management techniques to consider establishment of clean-up levels above background and at or below numerical limits that implement all applicable water quality objectives for groundwaters having beneficial uses. (See the "Setting Clean-up Levels" section below.)
- Compliance with groundwater clean-up levels must occur throughout the pollutant plume. (See the "Setting Clean-up Levels" section below.)
- Soil clean-up levels should be to background. Where soil clean-up levels remain above background, soil clean-up levels are established based upon acceptable health risks, if appropriate, and to ensure that any residual mobile pollutants generated would not cause ground or surface water to exceed applicable water quality objectives. Minimal dilution may be considered. (See the "Setting Clean-up Levels" section below.)
- Verification of soil cleanup generally requires follow-up groundwater monitoring. (See the "Setting Clean-up Levels" section below.)
- The Regional Board will review and seek input on its overall approach to managing site cleanups. (See the "Future Regulatory Management Strategies" section below.)

PROGRAM AREAS

Sites with identified pollution problems are managed through the following five program areas: (1) the Underground Storage Tank (UST) Program (>5,000 sites); (2) the Spills, Leaks, Investigation, and Cleanup (SLIC) Program (>400 sites); (3) the Department of Defense/Department of Energy Program (15 sites); (4) the U.S. EPA Superfund Program (30 sites); and (5) the Aboveground Petroleum Storage Tank Program (approximately 200 sites).

UNDERGROUND STORAGE TANK PROGRAM

Implementation of the Underground Storage Tank (UST) Program is unique, as the Health and Safety Code, Division 20, Chapters 6.7 and 6.75, gives local agencies the authority to oversee investigation and cleanup of UST leak sites. The Corrective Action regulations (CCR, Title 23, Chapter 16, Article 11) use the term "regulatory agency" in recognition of the fact that local agencies have the option to oversee site investigation and cleanup, in addition to their statutory mandate to oversee leak reporting and tank closure.

Local agencies now have independent authority under UST laws to require investigations and cleanup. The Regional Board still retains its Water Code authority to approve case closure. However, the Regional Board has authorized a few local agencies to close fuel leak cases where groundwater has not been polluted, and future groundwater impacts are not expected.

Some local agencies also provide oversight for underground fuel storage tank cases under a Local Oversight Program (LOP) contract with the State Water Board. Most oversight charges are billed to responsible parties.

Additionally, a few other local agencies have funded their own (non-LOP) oversight programs and have developed guidance documents based upon state and Regional Board guidance. Table 4-18 provides a brief summary of these agencies' programs.

Pertinent reference documents related to releases from underground storage tanks are described below.

- State regulations regarding underground tank construction, monitoring, repair, closure, release reporting, and corrective action are contained within CCR Title 23, Chapter 16.
- Specific recommendations regarding Chapter 16 soil and groundwater investigations are contained in "Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites," written by the staffs of the North Coast, Central Valley, and San Francisco Bay Regional Water Quality Control Boards. This document is commonly referred to as the "Tri-

Regional Guidelines." The document provides uniform procedures for performing investigations. It describes a systematic approach for determining which actions are required, including whether a soil cleanup only or a more comprehensive soil/groundwater investigation is required.

- Other local agency reference documents are listed on Table 4-18.

SPILLS, LEAKS, INVESTIGATION, AND CLEAN-UP PROGRAM (SLIC)

Sites that are managed within the SLIC program include those with pollution from recent or historical surface spills, subsurface releases (e.g., pipelines, sumps, etc.), complaint investigations, and all other unauthorized discharges that pollute or threaten to pollute surface or groundwater. There is some overlap with the UST program, as many SLIC cases also have leaking underground tanks. Alternatively, some cases that involve both leaking solvent tanks and other pollution sources may end up in the UST program.

Many historical spill cases were identified by the Regional Board in a survey conducted in early 1980s. New spills are identified through discharger reports, complaints to the Regional Board's field investigation team, the Regional Board's own surveillance, proposed property transfer reports, local agency reports, and other means. Initial response to spill incidents is generally handled by the Regional Board's Field Investigation Team. The case is then screened, with notices sent as appropriate under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Subsequent to the "control" of the spill, the case is transferred to SLIC program staff. High-priority cases are assigned for follow up by the SLIC program as staffing permits.

Investigation, remediation, and cleanup at SLIC sites proceeds under procedures outlined in State Board Resolution No. 92-49, discussed in the "Requirements for Site Investigation and Remediation" section below.

DEPARTMENT OF DEFENSE AND DEPARTMENT OF ENERGY PROGRAM

The goal of this program is the cleanup of pollution at federal military sites (Department of Defense – DoD) and federal energy agency sites (Department of Energy – DoE).

Investigation and cleanup at these sites must meet the requirements of the U.S. EPA "Superfund" hazardous waste clean-up program. This involves completion of the formal Preliminary Assessment, Site Investigation, Remedial Investigation, and Feasibility Study, all leading to a Record of Decision on an acceptable Remedial Action Plan.

The state has signed agreements with the Department of Defense (Defense-State Memorandum of Agreement) and Department of Energy (Agreement in Principle) establishing procedures under which site investigation and cleanup will proceed, decisions will be made, and disputes resolved. Regional and State Board staff oversight costs are fully or partially reimbursed by various cost-recovery mechanisms. At DoE sites, reimbursement is currently limited to tasks related to review of monitoring data and monitoring system adequacy to characterize sites and determine effectiveness of remedial actions. The potential exists to increase the scope of eligible reimbursement activities in the future.

The DoD program includes closing bases that are subsequently to be made available, to the extent possible, for sale or lease to private or public parties. There is considerable state and federal interest in moving parcels into economically productive uses, in part to offset the negative economic impact of base closures on the local community. Special care will be required to assure that such transfers are done in a manner consistent with protection of water quality, public health, and the environment.

U.S. EPA SUPERFUND PROGRAM

In April, 1988, the State and Regional Boards received a U.S. EPA grant for coordinating and enforcing groundwater cleanup at federal Superfund sites in the South Bay. The grant is known as the "South Bay Multi-Site Cooperative Agreement" (MSCA). The primary goals of MSCA are:

- To accelerate cleanup of polluted groundwater at Superfund sites in the South Bay;
- To augment the Regional Board's existing programs to ensure that U.S. EPA's requirements, as defined in the National Contingency Plan, are met for those sites on the National Priority List (Superfund) assigned to the Regional Board as lead agency; and
- To finance Regional Board staff support on U.S. EPA-lead Superfund sites to assure clean-up decisions meet state requirements.

At most of the 30 MSCA sites, the toxics threats and risks are either under short-term control (awaiting long-term solutions), or the responsible parties have constructed and/or

implemented long-term remediation projects. At the remaining sites, the Regional Board is requiring completion of Remedial Investigation/Feasibility Studies and proposed Remedial Action Plans (RAPs). After public review and comments on these studies and plans, the Regional Board will adopt the RAPs in individual Site Clean-up Orders. When U.S. EPA approves of the Regional Board's actions, it will administratively adopt a Record of Decision.

ABOVEGROUND PETROLEUM STORAGE ACT

The state's Aboveground Petroleum Storage Act was enacted in 1989 and amended in 1991. The act became effective on January 1, 1990.

The purpose of this act is to protect the public and the environment from the serious threat of spillage of millions of gallons of petroleum-derived chemicals stored in thousands of aboveground storage tanks. The act requires that the Regional Board inspect aboveground petroleum storage tanks used for crude oil and its fractions for their compliance with the federally required Spill Prevention, Control, and Countermeasure Plan. In the event that a release occurs that threatens surface or groundwater, the act allows the state to recover reasonable costs incurred in the oversight and regulation of the cleanup.

"Storage Statements" are required from the facilities describing the location, nature, and size of their tanks. Filing fees are required, which are intended to fund inspections, training, and research. There are approximately 225 facilities within the region that have filed their storage statements.

REQUIREMENTS FOR SITE INVESTIGATION AND REMEDIATION

The State Board adopted Resolution No. 92-49, "Policies and Procedures for Investigation, Cleanup and Abatement of Discharges Under Water Code Section 13304." This resolution contains the policies and procedures that all Regional Boards shall follow to oversee and regulate investigations and cleanup and abatement activities resulting from all types of discharge or threat of discharge subject to Section 13304 of the Water Code. Therefore, the five program areas listed above (i.e., UST, SLIC, DoD/DoE, Superfund, and Aboveground Storage) now follow the same policies and procedures outlined in Resolution No. 92-49 for determining:

- When an investigation is required;
- The scope of phased investigations necessary to define the nature and extent of contamination or pollution;
- Cost-effective procedures to detect, clean up or abate contamination; and
- Reasonable schedules for investigation, cleanup, abatement, or any other remedial action at a site.

State Water Board Resolution No. 92-49 outlines the five basic elements of a site investigation. Any or all elements of an investigation may proceed concurrently, rather than sequentially, in order to expedite cleanup and abatement of a discharge, provided that the overall clean-up goals and abatement are not compromised. State Water Board Resolution No. 92-49 investigation components are as follows:

a. Preliminary site assessment to confirm the discharge and the identity of the dischargers; to identify affected or threatened waters of the state and their beneficial uses; and to develop preliminary information on the nature and vertical and horizontal extent of the discharge;

b. Soil and water investigation to determine the source, nature, and extent of the discharge with sufficient detail to provide the basis for decisions regarding subsequent clean-up and abatement actions, if any are determined by the Regional Board to be necessary;

c. Proposal and selection of clean-up action to evaluate feasible and effective clean-up and abatement actions and to develop preferred clean-up and abatement alternatives;

d. Implementation of clean-up and abatement action to implement the selected alternative and to monitor in order to verify progress; and

e. Monitoring to confirm short- and long-term effectiveness of cleanup and abatement.

State Board Resolution No. 92-49 requires that the Regional Board ensure that the discharger is aware of and considers minimum clean-up and abatement methods. The minimum methods that the discharger should be aware of and consider, to the extent that they may be applicable to the discharge or threat thereof, are:

1. Source removal and/or isolation;
2. In-place treatment of soil or water, including bioremediation, aeration, and fixation;

3. Excavation or extraction of soil, water, or gas for on-site or off-site treatment techniques, including bioremediation; thermal destruction; aeration; sorption; precipitation, flocculation and sedimentation; filtration; fixation; and evaporation; and
4. Excavation or extraction of soil, water, or gas for appropriate recycling, reuse, or disposal.

PROGRESS OF THE REGIONAL BOARD'S PROGRAM

The Regional Water Board has over 12 years of experience in the cleanup of polluted sites. The following findings are drawn from this regulatory experience.

INVESTIGATION

- A complete on- and off-site investigation of soil and groundwater to determine full horizontal and vertical extent of pollution is necessary to ensure that adequate clean-up plans are proposed.

REMEDIATION

- Immediate removal of the source, to the extent practicable, is required to prevent further spread of pollution as well as its being among the most cost-effective remediation actions.
- Pump-and-treat groundwater remediation, in some instances, is effective in hydraulically containing pollution and removing pollutants.
- Vacuum extraction of pollutants in the vadose zone can be a cost-effective method to remove pollution sources.
- Bioremediation of petroleum pollution can be a cost-effective soil and groundwater treatment alternative.

LIMITS OF EXISTING TECHNOLOGY

- Available options for removing or treating in-situ polluted groundwater are limited.
- Recent research, much of which is being confirmed at sites within the region, demonstrates that using pump-and-treat technology removes and controls pollutant mass migration. However, pump-and-treat technology is not adequate technology, in some situations, to meet low concentration groundwater objectives because the costs and time-frames may be prohibitive.
- Groundwater pollution cleanup is lengthy and requires significant resources of both the discharger and the regulator.

SETTING CLEAN-UP LEVELS

The Regional Board approves soil and groundwater clean-up levels for polluted sites. State Board Resolution No. 92-49 requires conformance with the provisions of State Board Resolution No. 68-16 and applicable provisions of CCR Title 23, Chapter 15.

State Board Resolution No. 92-49 directs the Regional Board to ensure that dischargers are required to clean up and abate the effect of discharges. This cleanup and abatement shall be done in a manner that promotes attainment of either background water quality, or the best water quality that is reasonable if background levels of water quality cannot be restored, considering all demands being made and to be made on those waters and the total values involved: beneficial and detrimental, economic and social, tangible and intangible. In approving any alternative clean-up levels less stringent than background, apply Section 2550.4 of Chapter 15, or, for cleanup and abatement associated with underground storage tanks, apply Section 2725 of Chapter 16, while considering the factors in Section 2550.4 of Chapter 15. Any such alternative clean-up levels shall:

- Be consistent with maximum benefit to the people of the state;
- Not unreasonably affect present and anticipated beneficial uses of such water; and
- Not result in water quality less than that prescribed in the Water Quality Control Plans and Policies adopted by the State and Regional Boards.

GROUNDWATER CLEAN-UP LEVELS

The overall clean-up level established for a waterbody is based upon the most sensitive beneficial use identified. In all cases, the Regional Board first considers high quality or naturally occurring "background" concentration objectives as the clean-up levels for polluted groundwater and the factors listed above under "Setting Clean-up Levels." For groundwaters with a beneficial use of municipal and domestic supply, clean-up levels are set no higher than:

- Maximum Contaminant Levels (MCLs) or Secondary MCLs incorporated by reference in Chapter 3, whichever is more restrictive, or

- A more stringent level (i.e., below MCLs) based upon a site-specific risk assessment. Clean-up levels must be set to maintain the excess upperbound lifetime cancer risk to an individual of less than 1 in 10,000 (10^{-4}) or a cumulative toxicological effect as measured by the Hazard Index of less than one. For all sites performing risk assessments, an alternative with an excess cancer risk of 1 in 1,000,000 (10^{-6}) or less must also be considered.

The Regional Board determines excess cancer risks and the Hazard Index following U.S. EPA procedures (U.S. EPA's Risk Assessment Guidance for Superfund, Volume I, Parts A, dated August, 1989, B, dated December, 1991, and C, dated December, 1991, which are incorporated by reference into this plan). The Regional Board may modify U.S. EPA's approach outlined in these publications based on consultation with Cal/EPA's Office of Environmental Health Hazard Assessment or more current site- or pollutant-specific information.

Groundwater clean-up levels are approved on a case-by-case basis by the Regional Board. The Executive Officer or a local agency may approve clean-up levels as appropriately established by the Regional Board. Proposed final clean-up levels are based on a discharger-developed feasibility study of clean-up alternatives that compares effectiveness, cost, time to achieve clean-up standards, and a risk assessment to determine impacts on beneficial uses, human health, and the environment. Clean-up levels must also take into account the mobility, toxicity, and volume of pollutants. Feasibility studies of clean-up alternatives may include the guidance provided by Subpart E of the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300); Section 25356.1(c) of the California Health and Safety Code; U.S. EPA's Comprehensive Environmental Response, Compensation, and Liability Act; the State Board's Resolutions Nos. 68-16 and 92-49; and the Regional Board Resolution No. 88-160.

SOIL CLEAN-UP LEVELS

Soil pollution can present a health risk and a threat to water quality. The Regional Board sets soil clean-up levels for the unsaturated zone based upon threat to water quality. Guidance from U.S. EPA, California Department of Toxics Substances Control, and Cal/EPA's Office of Health Hazard Assessment is also considered on health risks. In addition, if it is unreasonable to clean up soils to background concentration levels, the Regional Board may:

- Allow residual pollutants to remain in soil at concentrations such that:
  a) Any residual mobile constituents generated would not cause groundwater to exceed applicable groundwater quality objectives, and
  b) Health risks from surface or subsurface exposure are within acceptable guidelines.
- Require follow-up groundwater monitoring to verify that groundwater is not polluted by chemicals remaining in the soil. Follow-up groundwater monitoring may not be required where residual soil pollutants are not expected to impact groundwater.
- Require measures to ensure that soils with residual pollutants are covered and managed to minimize pollution of surface waters and/or exposure to the public.
- Implement applicable provisions of Chapter 15 where significant amounts of wastes remain on-site. This may include, but is not limited to, subsurface barriers, pollutant immobilization, toxicity reduction, and financial assurances.

In order for a discharger to make site-specific recommendations for soil clean-up levels above background, the fate and transport of leachate can be modeled by the discharger using site-specific factors and appropriate models. Assumptions for minimal leachate dilution, as proposed by the discharger, may be considered by the Regional Board if deemed reasonable.

Clean-up levels are approved by the Regional Board. The Executive Officer or a local agency may approve clean-up levels as established by the Regional Board. Due to the tremendous number of sites with soil pollution, the Regional Board has considered developing "generic" clean-up levels for common soil pollutants. However, given the extreme variability of hydrogeologic conditions in the region, the Regional Board is presently unable to recommend levels that would be protective of groundwater at every site. One exception to this are clean-up standards for volatile organic chemicals (VOCs) and semi-volatile organic chemicals.

Several Regional Board orders, adopted primarily for Superfund sites, include clean-up standards of 1 mg/kg (ppm) for total VOCs, and 10 ppm for total semi-VOCs (as defined by EPA Methods 8240 and 8270, respectively, of the U.S. EPA Testing Methods for Evaluating Solid Waste, SW-846, 1986, which is incorporated by reference into this plan).

These standards apply to unsaturated soils only and are based on the modeling results at a Superfund site in the region and the professional judgement of Regional Board staff. As these are clean-up standards for total VOCs and total semi-VOCs, levels for individual constituents at polluted sites commonly are significantly lower than 1 ppm and 10 ppm, respectively. In particular, some constituents of concern have water quality standards of less than 5 ppb (e.g., benzene, vinyl chloride, ethylene dibromide). Individual clean-up levels well below the 1 ppm VOC and 10 ppm semi-volatile standards may be established for these constituents.

At this time, the Regional Board finds that these are appropriate clean-up levels for total VOCs and total semi-VOCs in the unsaturated zone at sites where groundwater is being monitored and where cleanup to background is unreasonable. At sites where it is determined that the 1 ppm clean-up level for total VOCs and 10 ppm clean-up level for total semi-VOCs may be inappropriate, the Executive Officer may modify these clean-up levels to whatever level is considered adequately protective of water quality, human health, and the environment.

A common misconception is that the Regional Board has developed "generic" clean-up levels for petroleum hydrocarbons (gasoline, gasoline by-products, and diesel). One source of the misconception is a misreading of Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites, written by the staffs of the North Coast, Central Valley, and San Francisco Bay Regional Boards. This document is commonly referred to as the Tri-Regional Guidelines. The Guidelines use 100 ppm total petroleum hydrocarbons in soil as one screening tool for prioritization. The 100 ppm level is not a "generic" clean-up level.

NON-ATTAINMENT OF GROUNDWATER CLEAN-UP LEVELS

The Regional Board has been developing policy, through the basin planning process, to address various situations when groundwater clean-up levels cannot be attained. After consideration of the Regional Board's proposed Basin Plan Amendment (Regional Board Resolution 94-101) to address non-attainment, the State Board adopted Resolution 94-117. Resolution 94-117 directs the State Board Executive Director to develop a statewide policy on groundwater and soil cleanup. In response to this, the State Board staff plans to amend State Board Resolution 92-49 to address non-attainment of groundwater clean-up levels. When Resolution 92-49 is formally approved, the Regional Board will implement the new sections on non-attainment.

FUTURE REGULATORY MANAGEMENT STRATEGIES

The following findings are drawn from the Regional Board's current regulatory experience:

- Risk assessment and management techniques can provide the Regional Board with a quantitative estimate of risks to assist in decision making.
- An inflexible, resource-intensive approach is not the most cost-effective, considering the multitude of existing and potential sources of groundwater pollution requiring cleanup.
- Institutional controls, such as deed restrictions, are an additional mechanism to protect beneficial uses and public health and safety. Guidance from U.S. EPA and the California Department of Toxic Substances Control is considered in setting institutional controls.

As a result of these findings regarding regulatory management strategy, the Regional Board will also review its overall approach to managing site cleanups. Table 4-19 lists options that the Regional Board plans to consider. Additional input regarding these and other options will be sought from all interested and affected parties during the triennial review of the Basin Plan.

GROUNDWATER PROTECTION PROGRAMS

The intimate ties between the land, surface water, groundwater, the Estuary, and human activity must be acknowledged in order to promote wise, balanced, and sustainable use of water resources. In this regard, the Regional Board will encourage planning and management by supplying tools and information that will provide an integrated environmental management approach to problem solving. It also must be recognized that groundwater quality and quantity are inextricably linked. Because an informed and involved citizenry is crucial to realizing groundwater protection, policies and plans should encourage and promote research, education, and public involvement as integral parts of any protection program.

Local water, fire, planning, and health departments are actively involved with their own groundwater protection programs. These programs include saltwater intrusion and land subsidence control, wellhead protection, groundwater recharge area preservation, hazardous materials storage and management ordinances, Local Oversight Programs and non-Local Oversight Programs for cleanup of leaking underground fuel tanks, potential conduit well destruction, and well permitting and inspection. For some agencies, maintaining funding for protection programs is an ongoing challenge. Through three specific projects, the Regional Board is evaluating the groundwater protection needs in specific basins, and thus will provide additional support for local agency efforts. These projects are described below.

GROUNDWATER RESOURCE STUDY

A basinwide approach for implementing and prioritizing groundwater cleanup was recommended in a series of reports titled "San Francisco Bay Region Groundwater Resource Study" (1987). The reports were a cooperative effort among the Regional Board and the University of California at Berkeley, School of Public Health, and Department of Landscape Architecture. The ten-volume series covered eight high priority groundwater basins: Niles Cone, Livermore and Sunol Valley, Ygnacio/Pittsburg/Clayton/San Ramon Basins, Suisun/Fairfield Basin, Napa Valley, Sonoma Valley, and San Mateo Basin.

Information regarding well location, construction, areal geology, permeability, and depth to groundwater; land-use characteristics; and location of pollution sources was compiled into a relational data base. A methodology was developed that weighs site sensitivity and pollution severity factors. Maps from the project illustrate the regional sensitivity of the above-groundwater basins to groundwater pollution.

Several of the policy options listed in Table 4-19 under "Streamline Existing Program" could be addressed by using the results of this planning program. In particular, the Regional Board will investigate the use of existing data and maps produced by the program, as well as other geographic information system-generated maps, as site screening tools to rank polluted sites and to assist in site-specific review of clean-up levels.

INTEGRATED ENVIRONMENTAL MANAGEMENT PROJECT

In 1987, U.S. EPA completed the Integrated Environmental Management Plan (IEMP). This innovative study conducted in Santa Clara County sought to improve public health and environmental protection by integrating approaches for hazardous material management for land, air, and water. The IEMP's Drinking Water Subcommittee developed recommendations to address the question, "How clean is clean?" The committee wrote, "....because contamination and clean-up impacts vary significantly in different sites and different hydrogeologic zones, the Regional Board should continue to develop and standardize a process for clean-up decision making, rather than establish across-the-board clean-up levels." This recommendation ties in with the policy options listed in Table 4-19 under "Streamline Existing Programs."

STATE BOARD GROUNDWATER PROTECTION PLANNING CONTRACT

At the Regional Board's request, the State Board is funding a contract with the University of California at Berkeley for development of a regional groundwater protection plan. The project focuses on the most-used, highest resource-value basins: Santa Clara Valley, Niles Cone, Livermore Valley, San Mateo Plain, and Half Moon Bay Terrace (Table 2-8). The vulnerability to pollution of each of the basins will be determined from the U.S. EPA's DRASTIC Index Method (U.S. EPA Project No. 600/2-87-035, April 1987) on a computer-based geographic information system.

An important component of the project will be the evaluation of present land and water use conditions, as well as those planned for 2005 and a long-term buildout (e.g., 2025). Working closely with local agencies, comprehensive protection plans will be recommended that can mitigate or minimize future resource impacts. These plans may include revised water quality objectives for basins or subbasins that have differing protection needs. Developing basin-specific objectives is one policy option listed in Table 4-19 under "Streamline Existing Programs." A final regional groundwater protection plan will be incorporated into the Basin Plan at a future date.

EMERGING PROGRAM AREAS

There are several aspects of protecting beneficial uses associated with aquatic systems that have emerged as critical issues in recent years. This section presents a prospective view of two emerging program areas that have increasingly become the focus of Regional Board activity. Each involves both an integration of approaches used in current Regional Board programs as well as innovative solutions.

WETLAND PLANNING

PILOT REGULATORY PROGRAM

The California Wetlands Conservation Policy (Governor's Executive Order W-59-93) included a regional strategy for wetlands planning and regulatory streamlining in the San Francisco Bay Area. This strategy calls for the incorporation of wetlands and restoration inventory information into a "broader, participatory wetlands planning effort" and directs the Regional Board to undertake a demonstration program to determine the feasibility of the state assuming Section 404 permitting authority from the federal government.

The Regional Board has undertaken a regulatory pilot project that will achieve the stated objective. The pilot project will allow the Regional Board to determine the most effective way to enhance the state's role in permitting efficiency of dredge and fill activities, while strengthening wetlands management and protection. The scope of the pilot project includes improvement of enforcement, inspection, and monitoring of CWA 404 permit conditions and laws; facilitation and coordination of public and permit reviewing agency interactions; application of a watershed management approach to CWA 404/401 permit review and enforcement activities; and Regional Board processing of dredging and wetland fill permits.

The pilot project will thus provide a basis for evaluating the effectiveness of uniting Section 404 permitting and Section 401 certification activities within one state agency that uses a watershed management approach. The evaluation of the results of the pilot project will be used to develop a long-term regulatory strategy that will enhance permitting efficiency and promote attainment of wetlands conservation goals as outlined in the State of California Wetlands Conservation Policy.

A final report will present conclusions and recommendations, including (a) assessment of the utility and feasibility of applying a watershed perspective to Section 404/401 decisions; (b) state consideration of Section 404 assumptions; and (c) development of a streamlined permit process. The final report will be completed in October, 1996.

SEDIMENT

Sediments in the larger San Francisco Bay Estuary system are both sources and sinks of pollutants. Under the Bay Protection and Toxic Cleanup Program, the Regional Board is conducting a detailed assessment of (a) the levels of pollutants in sediment throughout the Bay; and (b) the risks and benefits of cleaning up or otherwise managing existing hot spots.

Pollutant transport associated with sediments is also the subject of numerous studies, many of which are supported by the Regional Board. The dynamics of sediment movement, uptake of pollutants through the benthic food chain, and measurement of pollutant levels on suspended material are examples of such studies.

Finally, the environmental effects associated with the disposal or reuse of Estuary sediments have been extensively investigated within the context of the Regional Board's dredging management program. As part of this effort, the Regional Board has supported detailed research on developing sediment toxicity tests and sediment quality objectives.

The Regional Board will develop a comprehensive Sediment Management Strategy that integrates information and concerns regarding pollutants in sediment.

5 PLANS AND POLICIES

INTRODUCTION

In addition to the Basin Plan, many other plans and policies direct Regional Board actions or clarify the Regional Board's intent. The following pages describe State Board plans and policies and numerous Regional Board policies.

All of these policies may be revised periodically. Contact the Regional Board to determine whether a particular plan or policy is still current.

STATE WATER RESOURCES CONTROL BOARD STATEWIDE PLANS AND POLICIES

ANTIDEGRADATION POLICY—RESOLUTION 68-16

The "Statement of Policy with Respect to Maintaining High Quality of Waters in California," known as the Antidegradation Policy, requires the continued maintenance of existing high quality waters. It provides conditions under which a change in water quality is allowable. A change must:

- Be consistent with maximum benefit to the people of the state;
- Not unreasonably affect present and anticipated beneficial uses of water; and
- Not result in water quality less than that prescribed in water quality control plans or policies.

THERMAL PLAN

The "Water Quality Control Plan for the Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California," known as the Thermal Plan, specifies water quality objectives, effluent quality limits, and discharge prohibitions related to thermal characteristics of interstate waters, enclosed bays and estuaries, and waste discharges.

WATER QUALITY CONTROL POLICY

The "State Policy for Water Quality Control" declares the State Board's intent to protect water quality through the implementation of water resources management programs. It serves as the general basis for subsequent water quality control policies.

OCEAN PLAN

The "Water Quality Control Plan for Ocean Waters of California" (Ocean Plan) establishes beneficial uses and water quality objectives for waters of the Pacific Ocean adjacent to the California coast outside of enclosed bays, estuaries, and coastal lagoons. The Ocean Plan prescribes effluent quality requirements and management principles for waste discharge and specifies certain waste discharge prohibitions.

BAYS AND ESTUARIES POLICY

The "Water Quality Control Policy for the Enclosed Bays and Estuaries of California" (Bays and Estuaries Policy) will provide water quality principles and guidelines for the prevention of water quality degradation and the protection of beneficial uses of waters.

POWERPLANT COOLING POLICY

The "Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling" (Powerplant Cooling Policy) indicates the State Board's position on powerplant cooling, specifying that fresh inland waters should be used for cooling only when other alternatives are environmentally undesirable or economically unsound.

DELTA PLAN

The "Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh" (Delta Plan) and Water Rights Decision 1485 designate beneficial uses,

QUICK INDEX PAGE

establish water quality (salinity) and flow standards to protect the beneficial uses from State Water Project and Central Valley Project operations, and specify an implementation program. In 1991, the State Board adopted the Water Quality Control Plan for Salinity, which supersedes the 1978 Delta Plan. The 1991 Plan does not establish Delta outflow standards. Outflow and salinity standards for the Bay and Delta are being considered as part of State Board planning processes.

POLLUTANT POLICY FOR SAN FRANCISCO BAY AND THE DELTA

In 1990, the State Board adopted the "Pollutant Policy Document," which identifies and characterizes the pollutants of greatest concern in the Bay-Delta Estuary. This policy requires implementation of a mass emission strategy; a monitoring and assessment program; and strategies for discharges from boat yards, drydock facilities, and dredge disposal practices. In 1990, the Regional Board passed a resolution directing implementation of the Pollutant Policy.

NONPOINT SOURCE MANAGEMENT PLAN

The "Nonpoint Source Management Plan" outlines the objectives and framework for implementing source control programs, with an emphasis on voluntary Best Management Practices and cooperation with local governments and other agencies.

SOURCES OF DRINKING WATER POLICY

This policy, adopted by the State Board in 1988 (Resolution No. 88-63) and incorporated into the Basin Plan in 1989 (Regional Board Order No. 89-039), assigns Municipal and Domestic Supply designations to all waters of the state with certain exceptions. A water body that serves municipal or domestic use cannot have that designation removed.

POLICIES AND PROCEDURES FOR INVESTIGATION AND CLEANUP AND ABATEMENT OF DISCHARGES (STATE BOARD RESOLUTION NO. 92-49)

This policy defines the goal of pollution cleanup and abatement as achieving the best quality of water that is reasonable. In certain cases where it is not reasonable to restore water quality to background levels, case-by-case clean-up levels may be specified, subject to the water quality provisions of the Basin Plan, beneficial uses of the waters, and maximum benefit to the people of the state.

CALIFORNIA WETLANDS CONSERVATION POLICY (EXECUTIVE ORDER W-59-93)

This policy establishes state guidelines for wetlands conservation. The primary goal is to ensure no overall net loss and to achieve a long-term net gain in the quantity, quality, and permanence of wetland acreage in California.

RESOURCE VALUE OF TREATED GROUNDWATER — RESOLUTION NO. 89-21

The State Board, in approving the Regional Board's guidelines for the disposal of extracted groundwater from groundwater clean-up projects, urges the Regional Board to recognize the resource value of treated groundwater and to maximize its utilization for the highest beneficial uses for which applicable water quality standards can be achieved.

REGIONAL BOARD PLANS AND POLICIES

Plans and policies adopted by the Regional Board are classified under the following twelve headings for easy reference. Resolutions adopted prior to the revsion date of the plan are superceded unless specifically incorporated by reference into the plan. A discussion of each of the current Regional Board policies is under the appropriate heading.

- Cooperative Agreements
- Regional Monitoring, Data Use, and the Aquatic Habitat Program
- Discharger Reporting and Responsibilities
- Delta Planning
- Dredging
- Nonpoint Source Pollution
- On-site Waste Disposal and Waste Discharge
- Shellfish
- Vessel Wastes
- Water Reclamation
- Wetlands
- Groundwater

COOPERATIVE AGREEMENTS

Many different local, state, and federal agencies oversee activities that affect the beneficial uses of San Francisco Bay. To ensure that these activities are coordinated to the greatest possible degree, the Regional Board enters into formal cooperative agreements. These agreements indicate the specific issue area of concern to both agencies and may also describe processes by which coordination will take place. Agreements regarding general coordination are listed below. Others are listed under specific issue areas.

COORDINATION WITH THE SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION (BCDC)

In 1966, the Regional Board stated its intent to cooperate with BCDC to the fullest extent necessary to ensure the protection of the San Francisco Bay shoreline and water quality (Resolution No. 737). In 1970, the Board urged BCDC to (1) require wastes resulting from projects permitted by BCDC to be connected to existing sewer lines; and (2) disapprove or temporarily withhold approval of any project that would cause added waste loading on a community sewerage system that is not meeting Regional Board waste discharge requirements (Resolution No. 70-19).

MEMORANDUM OF UNDERSTANDING WITH THE DEPARTMENT OF FISH AND GAME—1966

The Regional Board has no means to conduct surveillance of ocean waters within its jurisdiction. Under the terms of this MOU, the Department of Fish and Game agrees to notify the Regional Board of any suspected violations of the Regional Board's requirements for ocean disposal.

STATE AND REGIONAL BOARDS WATER QUALITY COORDINATING COMMITTEE—RESOLUTION NO. 68-1

By adopting this resolution, the Regional Board approved a State and Regional Boards Coordinating Committee for the purposes of (1) coordinating and exchanging technical and administrative information; (2) augmenting staff support to the Water Quality Advisory Committee of the State Board; and (3) recommending action to be taken on water quality programs.

LOCAL AGENCY FORMATION COMMISSIONS—RESOLUTION NO. 73-17

This resolution describes actions that the Regional Board and these commissions could take that would result in a coordinated effort to prevent and abate pollution.

MEMORANDUM OF UNDERSTANDING WITH THE COUNCIL OF BAY AREA RESOURCE CONSERVATION DISTRICTS (RCDS)—1980

The purpose of this MOU is to combine the erosion control expertise of the RCDs with the regulatory authority of the Regional Board to enforce erosion control measures. This action will increase the Regional Board's ability to identify and correct erosion control problems associated with construction or agricultural activities.

WATER QUALITY MANAGEMENT: MOU WITH BCDC, STATE BOARD, AND THE REGIONAL BOARD—NO. 87-154

This MOU specifies a coordination process for the three agencies to implement water quality goals mandated by state and federal legislation and states the Regional Board's support in concept for legislation that would require a project applicant to obtain all discretionary approvals from the Regional Board before filing its BCDC permit application.

REGIONAL MONITORING, DATA USE, AND THE AQUATIC HABITAT PROGRAM

USE OF DATA COLLECTED BY THE AQUATIC HABITAT PROGRAM—RESOLUTION NO. 82-1

This resolution states how data collected by the Aquatic Habitat Program will be used and describes the Regional Board's intent to seek the assistance of the University of California in data quality control and interpretation. Possible uses of data include: (a) revising water quality objectives; (b) relaxing or tightening effluent requirements; (c) enforcement action; (d) dissemination of information to the public; (e) determining sources of pollution; and (f) determining assimilative capacities of receiving waters.

MODIFIED GUIDELINES FOR THE EFFLUENT TOXICITY CHARACTERIZATION PROGRAM—RESOLUTION NO. 91-083

This resolution modifies the requirements of the Effluent Toxicity Characterization Program (adopted as a Basin Plan amendment in 1986) to make them more cost effective and responsive to the region's biomonitoring needs after several years' experience with the program.

REGIONAL MONITORING PROGRAM—RESOLUTION NO. 92-043

In this resolution, the Regional Board endorses the development and implementation of a comprehensive, Estuarywide monitoring program that will regularly collect information on concentrations of pollutants in water, sediment, and biota.

DISCHARGER REPORTING AND RESPONSIBILITIES

RESPONSIBILITY OF DISCHARGERS FILING TECHNICAL REPORTS—RESOLUTION NO. 67-3

This resolution requires those dischargers filing technical reports to submit a letter of transmittal signed by the discharger's senior administrative officer with reports involving formal time schedules and cease-and-desist orders.

SELF-MONITORING REPORTS—RESOLUTION NO. 73-16

With this resolution, the Regional Board specifies the format and requirements for filing self-monitoring reports.

CONTINGENCY PLANS—RESOLUTION NO. 74-10

By adopting this resolution, the Regional Board requires dischargers to develop and implement contingency plans to assure continuous operation of facilities for the collection, treatment, and disposal of wastes.

WAIVING WASTE DISCHARGE REQUIREMENTS FOR SPECIFIC TYPES OF DISCHARGE — RESOLUTION NO. 83-3

The Regional Board waived the requirement of filing report of waste discharge for specific types of waste discharge that have a relatively insignificant adverse effect on water quality.

DELTA PLANNING

SAN LUIS DRAIN—RESOLUTION NOS. 535 (1964) AND 81-1

The Regional Board prohibits discharge by the proposed drain until evidence that the discharge would not threaten beneficial uses is submitted by the dischargers. The resolution (No. 535) also directs the staff to determine the beneficial uses of the proposed receiving waters and the conditions necessary for their protection. In 1981 (No. 81-1), the Regional Board requested that the State Board, in close coordination with the Regional Board, assume the lead role in the development, revision, renewal, and enforcement of waste discharge requirements for the proposed San Luis Drain.

PERIPHERAL CANAL—RESOLUTION NO. 80-6

In 1980, the Regional Board expressed its concern regarding the adverse impacts on water quality of certain projects authorized by Senate Bill 200 and endorsed protective measures for the Delta, Suisun Bay, and San Francisco Bay.

DREDGING

REGULATION OF DREDGING SEDIMENT DISPOSAL—RESOLUTION NO. 80-10

This resolution acknowledges the U.S. Army Corps of Engineers' implementation of new procedures for evaluating dredged material. The Regional Board agreed that the Corps should be responsible for the administration of the new procedures for evaluating discharges of dredged materials. The Regional Board reserved the right to act to protect water quality, if necessary. The resolution also gave the Regional Board's Executive Officer considerable discretion regarding additional water quality and sediment testing requirements, as well as monitoring for dredged sediment disposal impact.

DELEGATION OF AUTHORITY TO WAIVE CERTIFICATION FOR SMALL DREDGING PROJECTS—RESOLUTION NO. 87-53

In 1987, the Regional Board delegated authority to the Executive Officer to waive water quality certification for activities involving the excavation and disposal of 50,000 cubic yards or fewer of San Francisco Bay sediments and the filling of two acres or fewer of wetlands.

POLICY ON DISPOSAL OF DREDGED MATERIAL AND NEW PROJECTS—RESOLUTION NO. 89-130

In 1989, the Regional Board placed a limit on new dredging work, established annual and monthly targets for the volume of dredged material disposed of at designated sites, and restricted the disposal of dredged material to certain times of the year in order to protect migrating fish. The State Board subsequently modified the limits on new dredging (Resolution No. 90-10).

SCREENING CRITERIA AND TESTING REQUIREMENTS FOR USE OF SEDIMENT FOR WETLAND CREATION AND OTHER UPLAND USES—RESOLUTION NO. 92-145

In this resolution, the Regional Board established screening criteria to be used to evaluate the appropriateness of using dredged material for beneficial purposes.

TESTING GUIDELINES FOR DREDGED MATERIAL DISPOSAL AT BAY AREA SITES—RESOLUTION NO. 93-009

The Regional Board endorsed a set of testing guidelines developed in cooperation with the U.S. Army Corps of Engineers, U.S. EPA, and the Bay Conservation and Development Commission. To implement these guidelines, the Regional Board also directed staff to work towards establishing a coordinated agency

permit process for maintenance dredging permit applications.

NONPOINT SOURCE POLLUTION

CONTROL OF WATER POLLUTION FROM CONSTRUCTION OF DAMS—1953

The Regional Board adopted this motion to reduce the possibility of erosion during the construction of dams. For small projects not likely to cause erosion problems, the motion recommends that the Executive Officer send a letter to the responsible person advising him or her to take appropriate precautionary actions. For larger projects, the responsible person is required to submit a report of waste discharge.

SURFACE RUNOFF—RESOLUTION NO. 78-5

In this resolution, the Regional Board acknowledges surface runoff as a significant source of pollution in the San Francisco Bay Basin and resolves to take appropriate actions (e.g., best management practices) to reduce pollution loads from surface water runoff.

EROSION CONTROL FROM CONSTRUCTION ACTIVITIES—RESOLUTION NO. 80-5

The Regional Board, in this resolution, recognizes the seriousness of impacts on beneficial uses related to construction activities. The Regional Board identifies local governments as having the responsibility for controlling erosion from development activities and for adopting and administering erosion control ordinances. The Regional Board also stated its intent to monitor the progress of local governments in their adoption and implementation of effective erosion control programs.

DAIRY WASTES— RESOLUTION NOS. 74-11 AND 77-5

In 1974, the Regional Board passed Resolution No. 74-11, which prohibits the discharge of manure into a watercourse subject to flooding. This requirement augmented the State Board's "Minimum Guidelines for Animal Waste Management." Full compliance was initially scheduled to occur by September 1977, but was extended to 1978 for dairies outside the Tomales Bay and Walker Creek watersheds because of a severe drought (77-5).

INDUSTRIAL STORMWATER DISCHARGES— RESOLUTION NO. 92-118

In this resolution, the Regional Board authorized additional monitoring and reporting requirements for dischargers holding industrial stormwater NPDES permits in cases where the watershed is known to be adversely impacted by stormwater discharges, the pollution potential of the discharge cannot be assessed with the minimum information, or more information will lead to more effective control mechanisms.

LIABILITY FOR PARTIES ENGAGED IN ABANDONED MINE REMEDIATION— RESOLUTION NO. 93-078

In 1993, the Regional Board expressed concern regarding the incentives for cleaning up mines thought to be responsible for roughly 60 percent of copper loading to the Delta.

ON-SITE WASTE DISPOSAL AND WASTE DISCHARGE

The Regional Board's policy on small waste discharge systems has evolved considerably as the Bay Area has become more developed. The following section summarizes a series of resolutions regarding conditions under which the Regional Board would waive waste discharge reporting requirements. Generally, this waiver is only granted when a county or other government entity has an active permitting and monitoring program comparable to the Regional Board's.

SEPTIC, LEACHING, AND SMALL COMMUNITY SYSTEMS— RESOLUTION NO. 81 (1951)

This resolution stated the Regional Board's objection to the construction and use of wells for septic effluent disposal or street runoff, except when such wells discharge into geologic formations that at no time contain water suitable for domestic, agricultural, or industrial use.

WAIVER OF REQUIREMENT TO REPORT WASTE DISCHARGE FOR SYSTEMS REGULATED BY COUNTY AND LOCAL AGENCIES

In 1963 and 1964, the Regional Board waived its regulatory authority over waste discharge reporting for family dwellings using discrete systems, as long as they were already regulated by local health departments and met certain conditions. In the same resolutions, the Regional Board also urged local planning and legislative bodies to require connection to sewer systems for all new development whenever feasible. Resolutions were adopted for Alameda County (No. 512; 1963), Contra Costa County (No. 583; 1964), Napa County (No. 596; 1964), San Mateo County (No. 597; 1964), Solano County (No. 598; 1964), Sonoma County (No. 599; 1964), and Santa Clara County (No. 600; 1964). The

Solano County waiver (Resolution No. 598) was later amended by Resolution No. 75-12 in 1975, which indicated that the waiver would not apply to planned unit development with minimum lot sizes fewer than 2.5 acres, and by Resolution 83-1 (1983).

The Regional Board's general policy on discrete sewerage facilities was later amended by Resolution Nos. 78-14 (1978) and 79-5 (1979). The first described specific actions that would be taken by the Regional Board when it was presented with a proposal for new discrete sewerage systems and what specific requests it would make of local governments. In 79-5, the Regional Board set minimum guidelines for determining the adequacy of local ordinances for controlling individual wastewater treatment and disposal systems.

In 1980, the Regional Board (Resolution No. 80-9) requested that the County of Alameda correct deficiencies in its individual waste treatment and disposal systems program, acting under policies adopted in the Alameda County waiver (Res. 512) and discrete sewerage policies (Res. 78-14 and 79-5). In 1981, the Regional Board rescinded Resolution No. 597 and reissued a policy (Resolution No. 81-9) on waiving reporting of discharges from individual wastewater treatment and disposal systems in San Mateo County. The Contra Costa County Waiver was amended in 1983 (Res. 83-2), and the Marin County Waiver in 1984 (Res. 84-12).

SEWER AND ON-SITE SEWER DISPOSAL IN BOLINAS—RESOLUTION NOS. 85-007 AND 87-091

The Regional Board indicated its support of a moratorium on new sewer connections and new on-site sewage disposal systems adopted by the Marin County Board of Supervisors.

SPECIFIC PROHIBITIONS OF ON-SITE DISPOSAL SYSTEMS FOR STINSON BEACH AND GLEN ELLEN (RESOLUTION NOS. 73-13 AND 73-14) AND EMERALD LAKE HILLS (RESOLUTION NO. 76-7)

These resolutions prohibited waste discharges to on-site disposal systems in the Stinson Beach (Marin County) and Emerald Lake Hills and Oak Knoll Manor (San Mateo County) areas, with some exceptions to the prohibition. Resolution No. 73-13 has since been amended or clarified in Resolution Nos. 73-18, 74-5, 74-6, 77-2, 78-1, and 81-5. Resolution No. 78-1 amended the prohibition of discharge outlined in 73-13 by allowing the discharge of waste to individual leaching or percolation systems where such discharges are regulated by the Stinson Beach County Water District. The amendment was conditional.

CITY OF NOVATO—RESOLUTION NO. 87-155

In this resolution, the Regional Board stated its policy regarding a waiver of waste discharge reporting requirements from individual wastewater treatment systems in the City of Novato.

MEMORANDUM OF UNDERSTANDING WITH NAPA COUNTY REGARDING WINERY PROCESS TREATMENT AND DISPOSAL—1982 (UPDATED IN 1992)

Under this agreement, the Regional Board approved Napa County's program for monitoring winery on-site disposal.

SHELLFISH

POLICY STATEMENT WITH RESPECT TO THE IMPLEMENTATION OF TIME SCHEDULES FOR FACILITIES TO PROTECT SHELLFISH—RESOLUTION NO. 74-14

In this resolution, the Regional Board directed the Executive Officer to determine whether or not dischargers were providing or would be providing adequate protection to allow for sport harvesting of shellfish. The Regional Board also stated its intent to adopt a time schedule for protection (in conformance with staff guidelines).

SHELLFISH PROGRAM—RESOLUTION NOS. 78-8 AND 83-10

The first resolution directs the Executive Officer to develop and implement a program to determine the feasibility of opening shellfish beds for recreational use. The second resolution describes a phased shellfish protection program in which discharge limits for dry-season runoff to Anza Lagoon and other South Bay sites would be considered. In addition, the Regional Board urged BCDC to consider ways to eliminate or minimize potential dry season runoff from planned projects and directed review of discharger self-monitoring studies to determine when additional data are necessary to avoid effects on shellfish beds.

DESIGNATION OF TOMALES BAY UNDER THE 1993 SHELLFISH PROTECTION ACT—RESOLUTION 94-018

In this resolution, the Regional Board identified Tomales Bay as an area where the commercial shellfishery is threatened and authorized the formation of a technical advisory committee to investigate and develop a remediation strategy.

VESSEL WASTES

VESSEL SEWAGE DISCHARGE POLICY—RESOLUTION NO. 665 (1965)

The Regional Board, in this resolution, expressed concern over the discharge of untreated sewage from certain vessels over which it does not have jurisdiction. The Regional Board suggested that the discharge of vessel wastes be regulated by the federal government.

URGING BCDC TO REQUIRE SHORESIDE VESSEL WASTE FACILITIES—RESOLUTION NO. 70-1 (1970)

This resolution urged BCDC to require applicants for new or expanded marinas or port facilities to provide the following as permit conditions: (1) dockside sewers; (2) pumpout facilities at marinas with disposal to shoreside sewage facilities; and (3) adequate restroom facilities.

VESSEL WASTE DISCHARGES TO SAN FRANCISCO BAY—RESOLUTION NO. 70-65

Three recommendations were made in this resolution: (1) that owners of marinas provide dockside sewerage facilities and that owners of vessels with sanitary facilities install holding tanks; (2) that the State Board request the federal government to prohibit discharges of vessel wastes; and (3) that the legislature adopt legislation that would require waste holding tanks on vessels with sanitary facilities to transport the wastes to treatment plants.

VESSEL WASTE DISCHARGE INTO RICHARDSON BAY—RESOLUTION NO. 91-118

In this resolution, the Regional Board found that the Richardson Bay Regional Agency's Implementation Plan and associated local ordinances will provide a mechanism for enforcing the prohibition against vessel waste discharge in the area.

WATER RECLAMATION

WATER REUSE STUDY—RESOLUTION NO. 79-2

In this resolution, the Regional Board stated its position regarding Phase II of the San Francisco Bay Area Water Reuse Study. The Regional Board acknowledged the importance of using reclaimed water to meet California's future water supply needs and commented on the economics of the delivery of reclaimed water to users.

REUSE OF MUNICIPAL WASTEWATER BY PETROLEUM REFINERIES—RESOLUTION NO. 88-083

The Regional Board indicated its support for the refining industry's use of reclaimed water from municipal plants.

CONDITIONAL WAIVERS OF WASTE DISCHARGE REQUIREMENTS FOR CERTAIN RECLAMATION PROJECTS DURING DROUGHT CONDITIONS—RESOLUTION NO. 88-88

This resolution sets forth conditions for new or expanded reclamation projects that use wastewater to support beneficial uses and, as a result, conserve potable and/or groundwater supplies.

PLAN FOR WATER RECLAMATION AS FULFILLMENT OF FLOW LIMITATION REQUIREMENT—RESOLUTION NO. 91-152

In this action, the Regional Board requested that the State Board accept a water reclamation plan submitted by the San Jose/Santa Clara Water Pollution Control Plant in lieu of a discharge flow limit. The reclamation plan includes potable and non-potable reclamation and the creation of a wetland to protect against the possibility of further degradation of salt marsh habitat by freshwater flows.

WETLANDS

USE OF WASTEWATER TO CREATE, RESTORE, AND ENHANCE MARSHLANDS—RESOLUTION NOS. 77-1 AND 94-086

These resolutions describe the Regional Board's policy regarding the use of wastewater to create, restore, maintain, and enhance marshlands. In general, the policy supports the use of wastewater to support new wetland habitat, under the condition that beneficial uses established are fully protected.

USE OF CONSTRUCTED WETLANDS FOR URBAN RUNOFF POLLUTION CONTROL—RESOLUTION NO. 94-102

In this resolution, the Regional Board expressed support for the construction of new wetland areas for the purpose of reducing pollutant loading from urban runoff, under certain conditions.

GROUNDWATER

DISPOSAL OF EXTRACTED GROUNDWATER FROM CLEAN-UP PROJECTS—RESOLUTION NO. 88-160

In this resolution, the Regional Board established priorities for the disposal of water

extracted from groundwater clean-up sites. The first priority is to reclaim effluents to the extent reclamation is technically and economically feasible. If this is not possible, then discharge to a municipal treatment plant was determined to be in the public interest. If neither reclamation nor discharge to a municipal plant is feasible, the Regional Board will issue NPDES permits authorizing discharge from these sites.

6 SURVEILLANCE AND MONITORING

INTRODUCTION

The effectiveness of a water quality control program cannot be judged without information supplied by comprehensive surveillance and monitoring of water, sediment, aquatic resources, and the human activities that have the potential to impact beneficial uses. The following section describes the monitoring programs that together provide high quality, comprehensive scientific information on water quality in the San Francisco Bay region. The Regional Board uses information produced by the programs described below to satisfy the requirements of Sections 104, 106, 208, 301, 303, 304, 305, 307, 308, 314, and 402 of the federal Clean Water Act and applicable portions of the state's Porter-Cologne Water Quality Control Act.

REGIONAL MONITORING PROGRAM

The Regional Monitoring Program forms the core of water and sediment quality monitoring in the San Francisco Estuary. Historically, water quality in the region was tracked by Regional Board and State Board research and monitoring programs and numerous studies carried out by other interested state, federal, and local agencies.

In 1993, the Regional Monitoring Program (RMP) was formally established to provide integrated, comprehensive, and systematic information on water quality in the region. Its goal is to evaluate the effectiveness of the Regional Board's water quality program in meeting Basin Plan objectives, including protection of beneficial uses in the San Francisco Estuary. The Regional Monitoring Program's specific objectives are to:

- Obtain baseline data and continue development of a data set that describes the concentration of toxic and potentially toxic trace elements and organic contaminants in the water and sediment and long-term trends in these concentrations;
- Determine seasonal and annual trends in chemical and biological water quality;
- Determine whether water quality and sediment quality in the Estuary at large are in compliance with the Basin Plan; and
- Provide a data base on water and sediment quality compatible with data being developed in other ongoing studies in the region, such as wasteload allocations, model development, sediment quality objectives, in-bay studies of dredged material disposal, primary productivity studies, local effects biomonitoring programs, and state and federal Mussel Watch programs.

The 46 federal agencies, local special districts, and private companies that hold Regional Board permits for waste discharge into the Estuary sponsor the Regional Monitoring Program. The San Francisco Estuary Institute (formerly the Aquatic Habitat Institute), an independent nonprofit organization, administers and manages the program under a Memorandum of Understanding with the Regional Board.

The design of each study component of the RMP draws directly from results of short-term, intensive pilot studies. Between 1989 and 1992, the Regional Board conducted a number of these studies, including determination of background levels of toxicity and water and sediment chemistry in different basins; critical habitat investigations to determine if high levels of contaminants were present in sensitive areas around the Bay margin; an in-depth analysis of sediment toxicity testing along a contaminant gradient; and an assessment of the temporal, spatial, and species-related variability of bivalve pollutant bioaccumulation

In 1993, the RMP sampled at 16 locations over three seasons (wet, dry, and spring peak riverine flow) for conventional water quality parameters and chemistry, water toxicity, sediment quality and chemistry, sediment toxicity, and bivalve bioaccumulation (Figure 6-1). Table 6-1 lists the trace metal and organic

QUICK INDEX

compounds analyzed for in the RMP. Pilot studies conducted in 1993 include plankton community spatial and temporal variability and suspended sediment dynamics.

To complement the system-wide Regional Monitoring Program, intensive surveys of limited areas are often conducted. This monitoring is typically done to evaluate specific contamination or beneficial use problems, such as cases where receiving water quality objectives have been violated.

Full implementation of the San Francisco Estuary Project's *Comprehensive Conservation and Management Plan* and the state Bay Protection and Toxic Cleanup Program will involve two elements:

- Initiating new monitoring elements in the RMP, such as identifying sediment reference sites, tracking contaminant levels in fish caught for food, and monitoring wetlands; and
- Ensuring closer coordination between the RMP and other major programs, such as the Interagency Ecological Studies Program (IESP) and the Long Term Management Strategy for Dredging (LTMS), including monitoring conducted by citizen volunteers in ongoing work.

STATE MUSSEL WATCH AND TOXIC SUBSTANCES MONITORING PROGRAMS

In 1976, the state initiated the State Mussel Watch and State Toxic Substances Monitoring Programs to regularly monitor the concentration of pollutants in the tissue of aquatic organisms. Tissue levels reflect exposure over much longer periods of time than instantaneous water column samples and provide a field-based estimate for exposure of people, fish, and wildlife to pollutants in the food chain.

The Mussel Watch Program uses resident and transplanted bivalves to monitor pollutant levels at coastal reference stations and selected sites in bays and estuaries to confirm potential toxic substance pollution. The location and sampling history of Mussel Watch stations in the San Francisco Bay Region are summarized in Figure 6-2 and Table 6-2. Periodic monitoring of bivalve tissue conducted by the National Mussel Watch administered by the National Oceanic and Atmospheric Association (NOAA) and international surveys complements information from the State Mussel Watch Program.

The Toxic Substances Monitoring Program uses resident fish and other aquatic organisms to monitor pollutant levels in freshwater systems throughout the state. The location and sampling history of Toxic Substances Monitoring stations in the region are summarized in Figure 6-3 and Table 6-2.

SACRAMENTO-SAN JOAQUIN RIVERS AND NORTHERN SAN FRANCISCO BAY ESTUARY WATER QUALITY SURVEILLANCE

Water flowing into the San Francisco Estuary from the Sacramento and San Joaquin rivers is regularly monitored by numerous agencies and programs, including the Sacramento Coordinated Water Quality Monitoring Program (in the Sacramento metropolitan area), the Department of Water Resources, the Central Valley Regional Water Quality Control Board, and the Interagency Ecological Studies Program. Conventional water quality parameters, water and suspended material chemistry, and toxicity are sampled at a network of stations located throughout the Delta and into San Pablo Bay. In addition, phytoplankton, benthic community, and beneficial use surveys are regularly conducted in this area.

The primary goals of these efforts are to: (a) assure riverine water quality meets applicable standards; (b) identify changes in water quality potentially related to the operation of the State Water Project; and (c) develop technical information that can be used to estimate mass loading of pollutants to the Estuary from riverine sources.

GROUNDWATER MONITORING NETWORKS

Groundwater monitoring networks are established in several basins in the region. At present, there are networks in Livermore Valley, Niles Cone, Santa Clara Valley, Half Moon Bay Terrace, and Napa Valley. In order to find out the most current status of these networks, local water management agencies should be contacted directly. In addition, the U.S. Geological Survey and state Department of Water Resources maintain regional monitoring networks. Typically, monitoring is conducted at least annually for general mineral quality and water levels. This well data may be of use to determine the general potability of groundwater and the status of sea water intrusion control. The Regional Board is integrating the locations of monitoring well networks into its groundwater geographic infor-

mation system. The water quality data generated from the networks will assist Regional Board staff in the refinement of beneficial use designations for groundwater basins.

COMPLIANCE MONITORING

A second component of the state's water quality surveillance and monitoring program relates specifically to discharges of pollutants at individual point and nonpoint sources. All entities holding Regional Board discharge permits must conduct regular sampling and analysis of waste released to surface and groundwaters. They must also analyze material to be dredged. The specific chemical and physical parameters, types (i.e., toxicity tests, bioaccumulation studies, waste stream sampling, etc.), frequency, and other information requirements are determined on a case-by-case basis according to the nature of the discharge and potential environmental effects. Each permit issued by the Regional Board describes the specific compliance monitoring requirements for that permit holder. Monitoring data collected by point source dischargers and nonpoint pollution control programs are used to:

- Determine compliance with and provide documentation to support enforcement of permit conditions;
- Support derivation of effluent limitations and wasteload allocations; and
- Provide information needed to relate receiving water quality to mass emissions of pollutants by dischargers.

Self-monitoring data are often supplemented by information obtained by Regional Board staff during site inspections (including waste analyses) and through special studies, such as those characterizing the variability of the discharge, pollutant levels in nearby receiving water and biota, and characterization of pollutant loads attributable to urban runoff.

COMPLAINT INVESTIGATION

The Regional Board encourages members of the public to alert it to pollutant discharge or nuisances that may impact water quality. Staff respond to each complaint, document the observed conditions, and take any necessary follow-up actions to institute appropriate corrective measures.

BIENNIAL WATER QUALITY INVENTORY

The Regional Board prepares a biennial report on water quality (as required under Section 305(b) of the Clean Water Act, PL 92-500). This report includes (a) a description of the water quality of major navigable waters in the state during the preceding years; (b) an analysis of the extent to which significant navigable waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife and allow recreational activities in and on the water; (c) an analysis of the extent to which elimination of the discharge of pollutants is being employed or will be needed; and (d) an estimate of the environmental impact and the economic and social costs necessary to achieve the "no discharge" objective of PL 92-500, the economic and social benefits of such achievement, and an estimate of the date of such achievement. Recommendations as to the programs that must be undertaken are provided, along with estimates of the cost.

OTHER MONITORING PROGRAMS

In addition to the state's surveillance and monitoring program, several other agencies in the Bay Area monitor water quality, including local city and county offices, federal agencies, and water supply districts. Local universities also conduct research and monitoring activities. All of these programs provide additional information and data that enhance the state's efforts.

TABLE 6-1 PARAMETERS ANALYZED FOR IN THE REGIONAL MONITORING PROGRAM

Water Quality Parameters	Sediment Quality Parameters
Temperature	Percent Fine (<63 µm dia.)
Salinity	Eh
Dissolved Oxygen	pH
pH	Temperature
Total Suspended Solids	Total Organic Carbon
Dissolved Organic Carbon	Total Nitrogen
Total Chlorophyll	
Phaeophytin	
Dissolved Phosphates, Silicates, Nitrate, Nitrite, and Ammonia	

Trace Elements in Water, Sediment, and Biota	Trace Organics in Water, Sediment, and Biota	
Aluminum	**Petroleum Compunds**	**Synthetic Biocides**
Arsenic	Alkanes, n-C12 to n-C32	Hexachlorocyclo-hexanes
Cadmium	Phytane	Chlordanes (incl. heptachlor epoxide)
Chromium	Total saturated and aromatic hydrocarbons	DDTs
Copper	PAHs	Dieldrin
Cyanide	Anthracene	Endosulfan
Iron	Fluoranthene	Chlorpyrifos
Lead	Pyrene	Dacthal
Mercury	Benzo(a)anthracene	Diazinon
Nickel	Chrysene	
Manganese	Benzo(b)fluoranthene	
Selenium	Benzo(k)fluoranthene	**Nonbiocide Synthetics**
Silver	Benzo(a)pyrene	Hexachlorobenzene
Tributyltin	Benzo(e)pyrene	Polychlorinated terphenyls
Zinc	Indo(1,2,3-c,d)pyrene	PCBs, total and selected congeners
	Dibenzo(1,h)anthracene	
	Benzo(g,h,i)perylene	
	1-methylphenanthrene	
	Total methylphenanthrenes	

TABLE 6-2 KEY TO FIGURE 6-2 STATE MONITORING NETWORK

State Mussel Watch Stations

Code	Station	Sampling History
M1	Tomales Bay	1979-82;1991
M2	Point Reyes	1977-78;1991
M3	Suisun Bay	1987
M4	Bolinas	1980
M5	Concord/Pier 4	1987
M6	Concord/Seal Island	1987
M7	Selby Slag 4	1988
M8	Selby Slag 5	1988
M9	Selby Slag 6	1988
M10	Selby Slag 7	1988
M11	Mare Island	1985;1987-88
M12	Davis Point	1980;1982;1988
M13	Union Oil Outfall	1988
M14	Point Pinole	1980-88;1990-91;1993
M15	Castro Cove Bridge	1988;1990
M16	Richmond Bridge	1980-82
M17	Santa Fe Channel	1986;1991
M18	Lauritzen Canal/Mouth	1985-88
M19	Lauritzen Canal/End	1986-88;1991
M20	Santa Fe Channel/End	1985-87;1991
M21	Richmond Harbor	1985-88
M22	Staufer's	1982
M23	Serl Intake	1991
M24	Point Isabel	1988
M25	Angel Island	1980-82
M26	Fort Baker	1981-82;1991;1993
M27	Alcatraz Island	1989
M28	Treasure Island	1979-83;1985-88;1990-91;1993
M29	Alameda Yacht Harbor	1985-88
M30	Oakland Inner Harbor	1986-87
M31	Embarcadero Cove	1985-88;1991;1993
M32	Lake Merritt	1992-93
M33	Oakland Back Harbor	1985-88
M34	San Francisco Outfall	1988
M35	Islais Channel	1987-88
M36	Hunter's Point	1981-82;1991;1993
M37	Hunter's Point/Shipyard	1988
M38	San Mateo Bridge/8B	1980-83;1985-87;1990-91
M39	San Mateo Bridge/8A	1982
M40	San Mateo Old Bridge	1982
M41	Belmont Slough	1982
M42	Redwood Creek	1981-83;1985;1991;1993
M43	Channel Marker 10	1982
M44	Redwood Creek/Towers	1982
M45	Tradewinds	1980;1982
M46	Redwood City/Outfall	1982
M47	Pete's Marina	1982
M48	Bair Island	1987
M49	Pulgas	1982
M50	San Francisco Airport	1982
M51	Dumbarton Bridge	1980-83;1985-88;1991
M52	Palo Alto Outfall	1988;1990
M53	Newark Slough	1982
M54	Channel Marker 17	1982
M55	Palo Alto	1982;1991;1993
M56	Palo Alto/Yacht Club	1982;1991
M57	Alviso Slough	1982
M58	Duxbury Reef	1979-81
M59	Muir Beach	1979
M60	Point Bonita	1980
M61	Farallon Islands	1977-78;1980
M62	Cliff House	1980
M63	Pacifica	1980
M64	J. Fitzgerald	1977-79;1981;1991
M65	Pescadero Creek	1988-89

TABLE 6-3 KEY TO FIGURE 6-3 STATE MONITORING NETWORK

State Toxic Substances Monitoring Stations

Code	Station	Sampling History
T1	Alameda Creek	1991-1992
T2	Alameda Creek	1985
T3	Alamitos Creek	1986-1988
T4	Almaden Reservoir	1988-1990
T5	Anderson Reservoir	1982
T6	Bear Gulch Reservoir	1989
T7	Calabazas Creek	1987-1989
T8	Calero Reservoir	1986
T9	Coyote Ck./ Brokaw Rd	1986-1989
T10	Coyote Ck./ Percolation	1990
T11	Coyote Ck./ Montague	1981-1984
T12	Coyote Reservoir	1983
T13	Dry Creek	1990
T14	Elmhurst Creek	1988
T15	Guadalupe Creek	1986
T16	Guadalupe Reservoir	1986
T17	Guadalupe River	1981-1984
T18	Guadalupe River	1986
T19	Lake Chabot	1989
T20	Lake Herman	1985-1986
T21	Lake Merced	1986
T22	Los Gatos Creek	1989
T23	Napa River/ Napa	1978-1979, 1990-1993
T24	New York Slough	1988
T25	Petaluma River	1992-1993
T26	San Leandro Creek	1986-1987
T27	San Pablo Creek	1985
T28	Sonoma Creek	1993
T29	Stevens Creek	1990-1992
T30	Stevens Ck. Reservoir	1989
T31	Suisun Bay	1986-1993
T32	Vasona Lake	1989-1990
T33	Walker Creek	1991-1993
T34	Walnut Creek	1991-1993

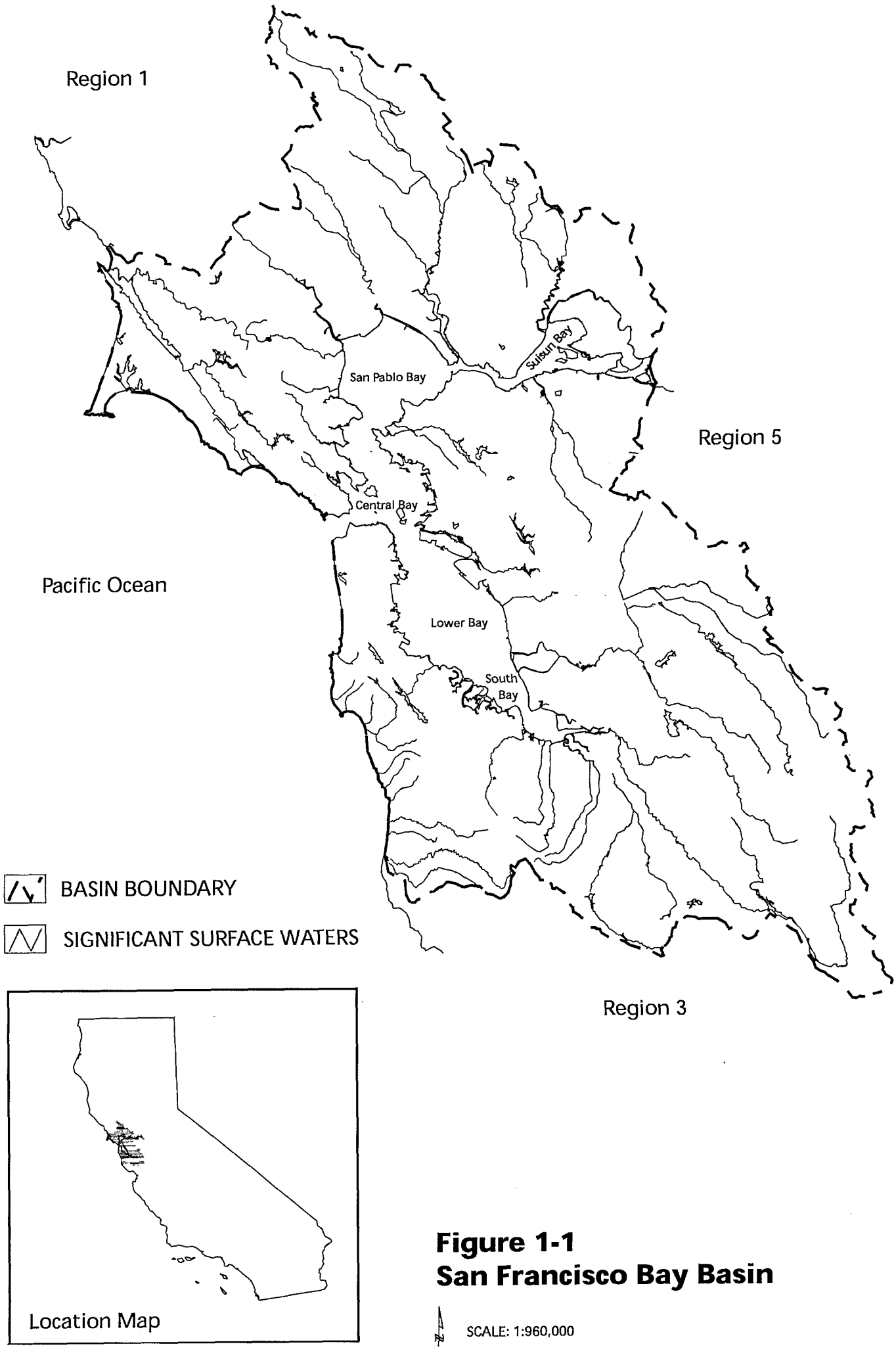


Figure 1-1
San Francisco Bay Basin

C-107604

C-107604

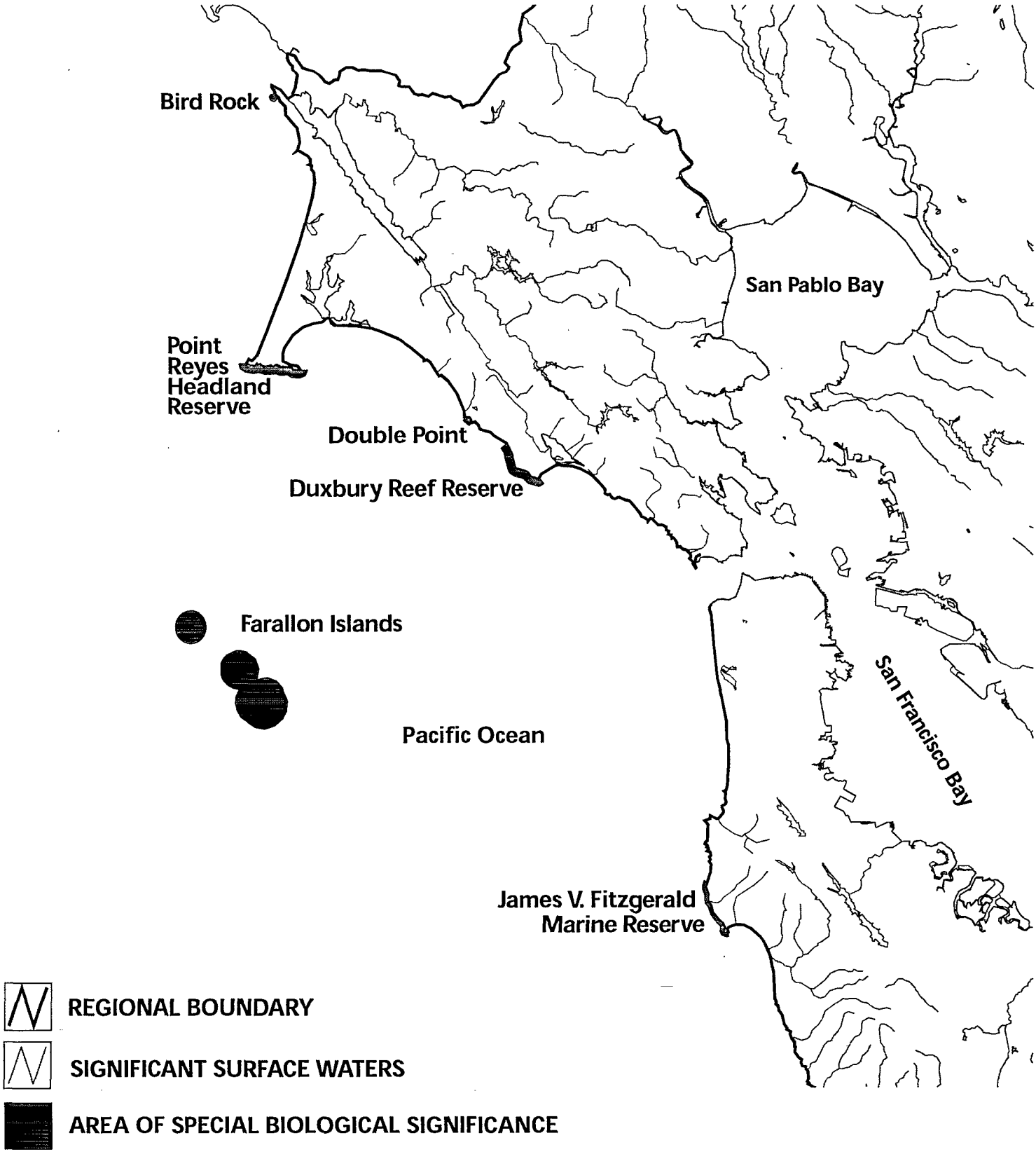
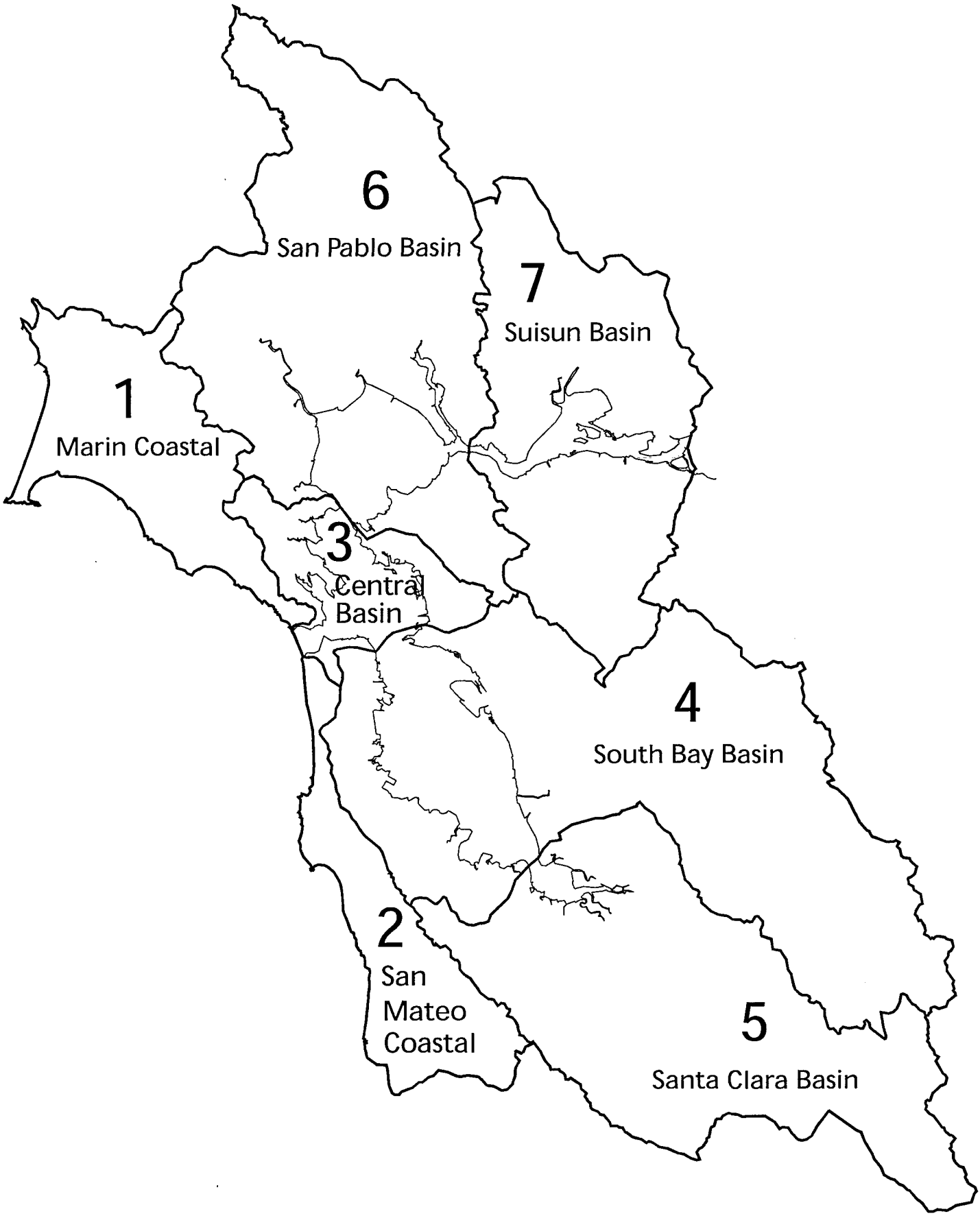


Figure 2-1
Areas of Special Biological Significance

SCALE: 1:600,000

C-107605

C-107605



BASIN BOUNDARY

MAJOR HYDROLOGIC BASIN PLANNING AREAS

Figure 2-2
Hydrologic Planning Areas

SCALE: 1:800,000

C-107606

C-107606

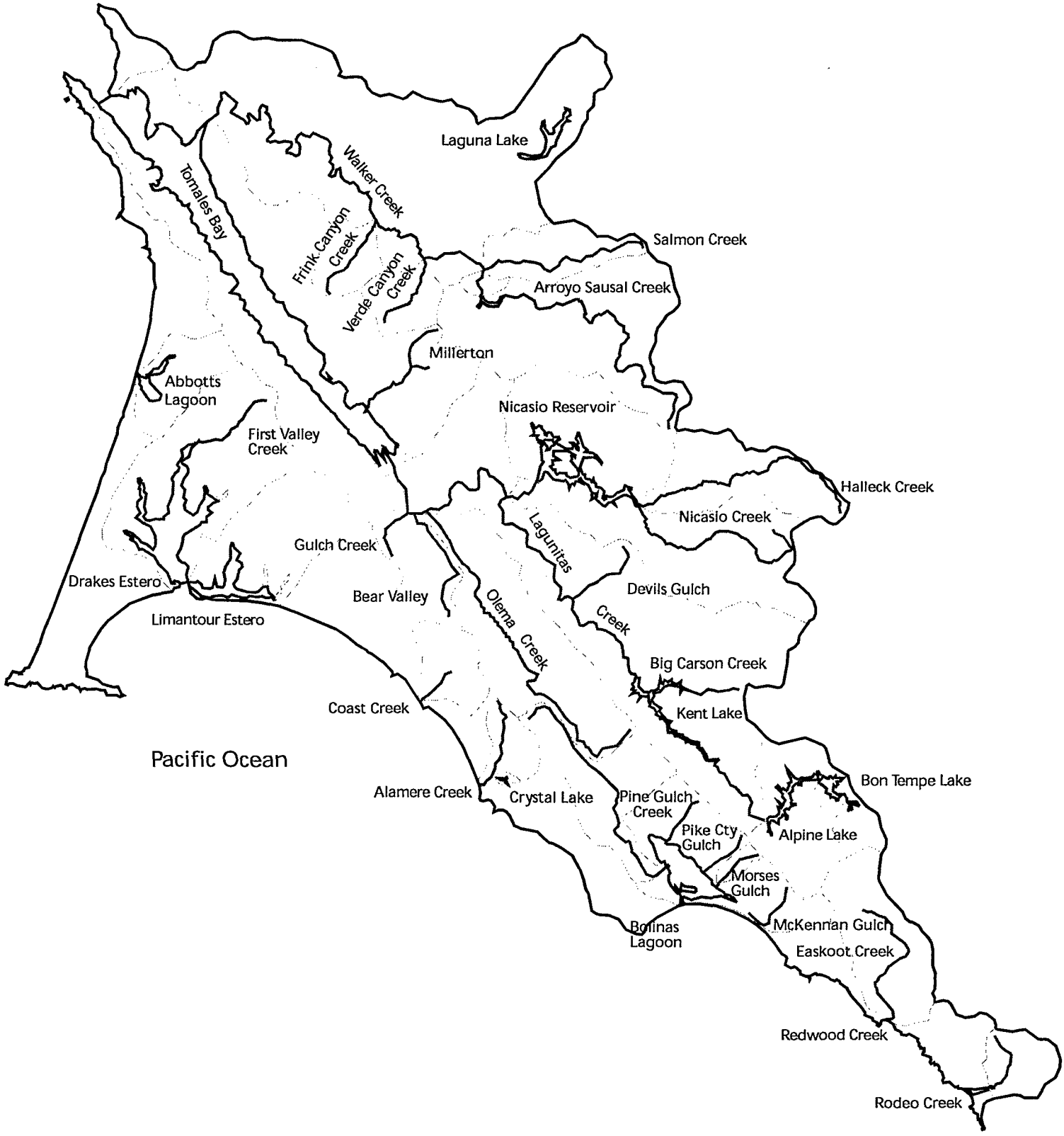


Figure 2-3
Marin Coastal Basin (1)

SCALE: 1:250,000

BASIN BOUNDARY

SIGNIFICANT SURFACE WATERS

SIGNIFICANT SUBWATERSHED BOUNDARY

C-107607

C-107607

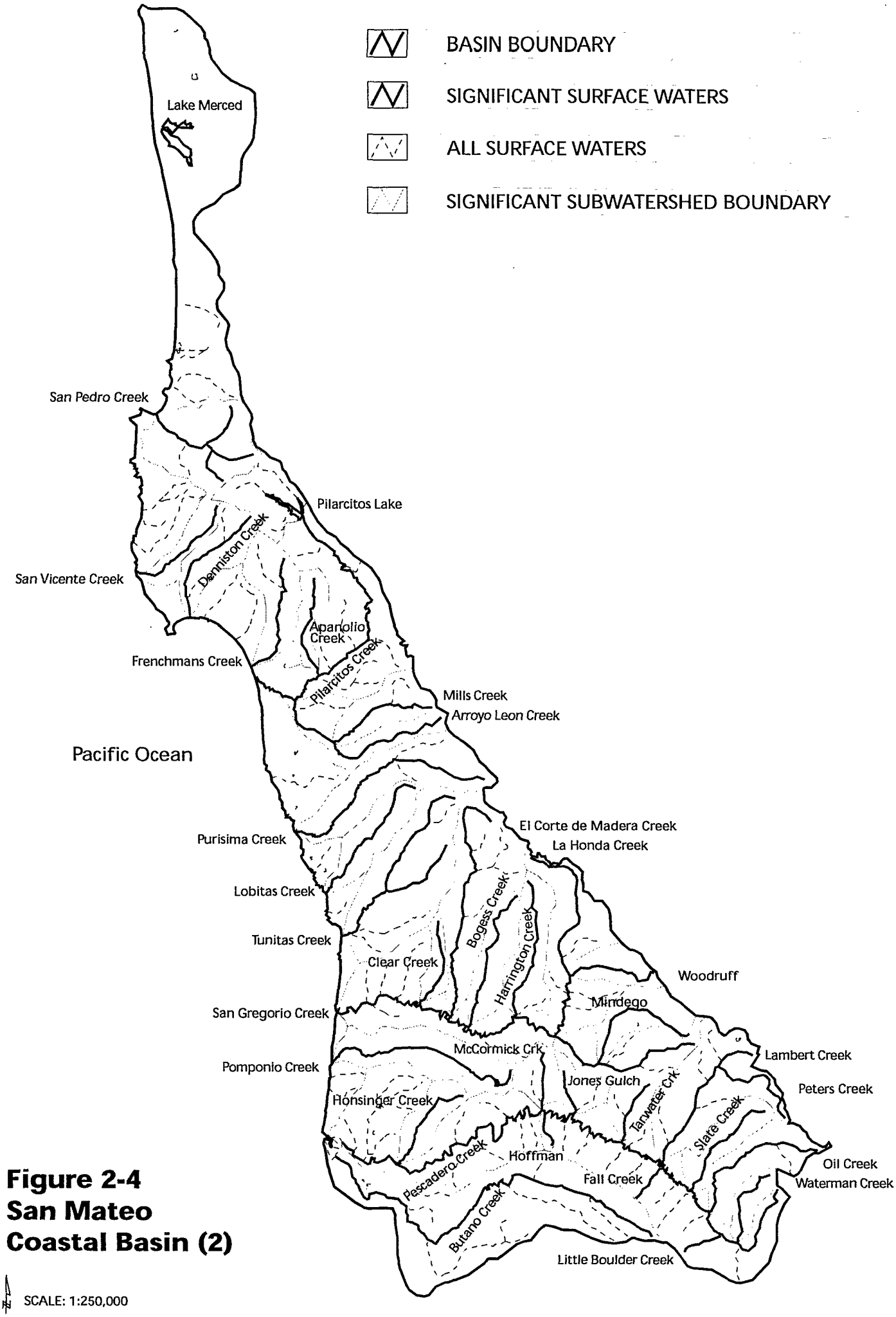
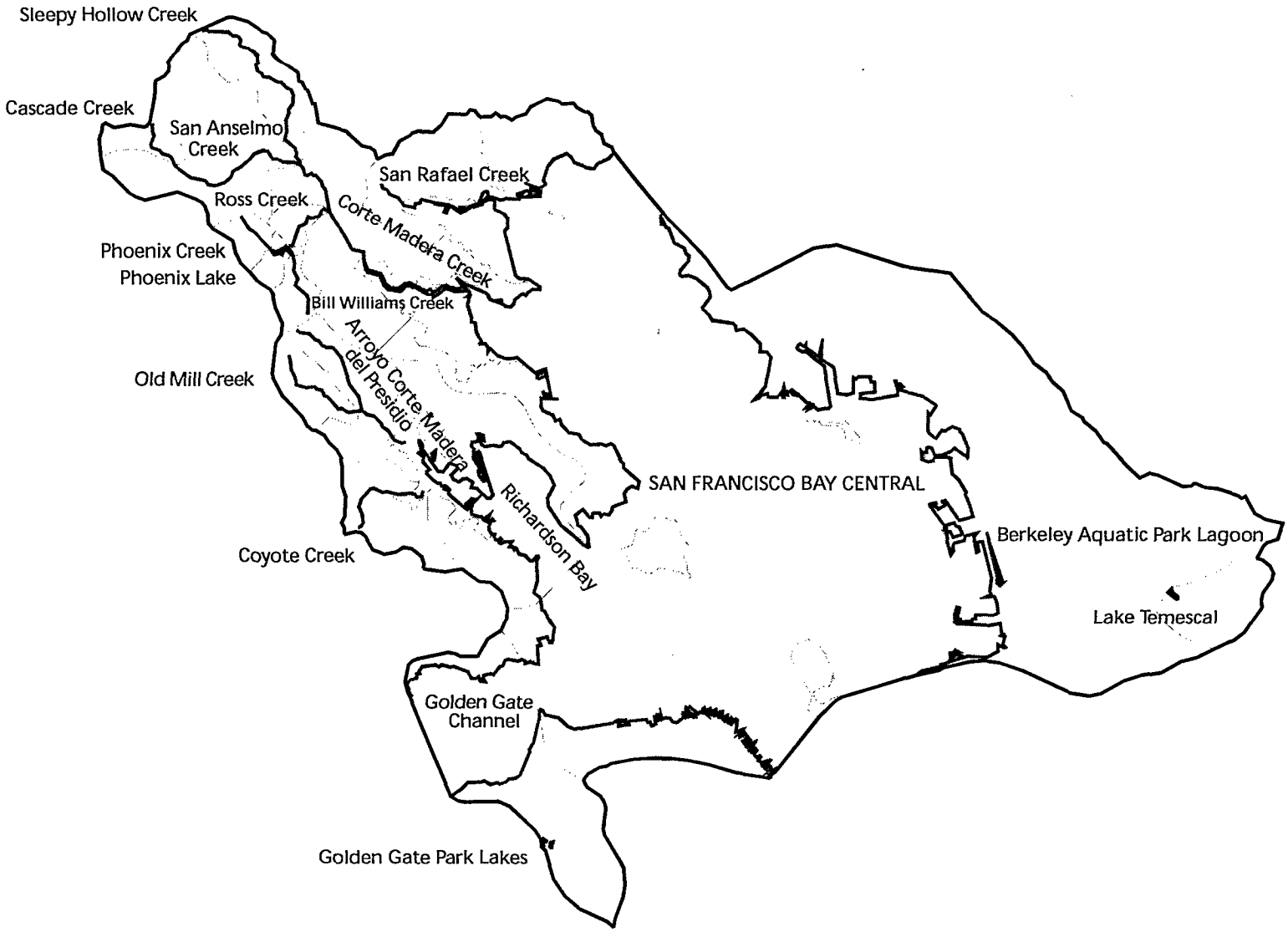


Figure 2-4
San Mateo
Coastal Basin (2)

C—107608



BASIN BOUNDARY

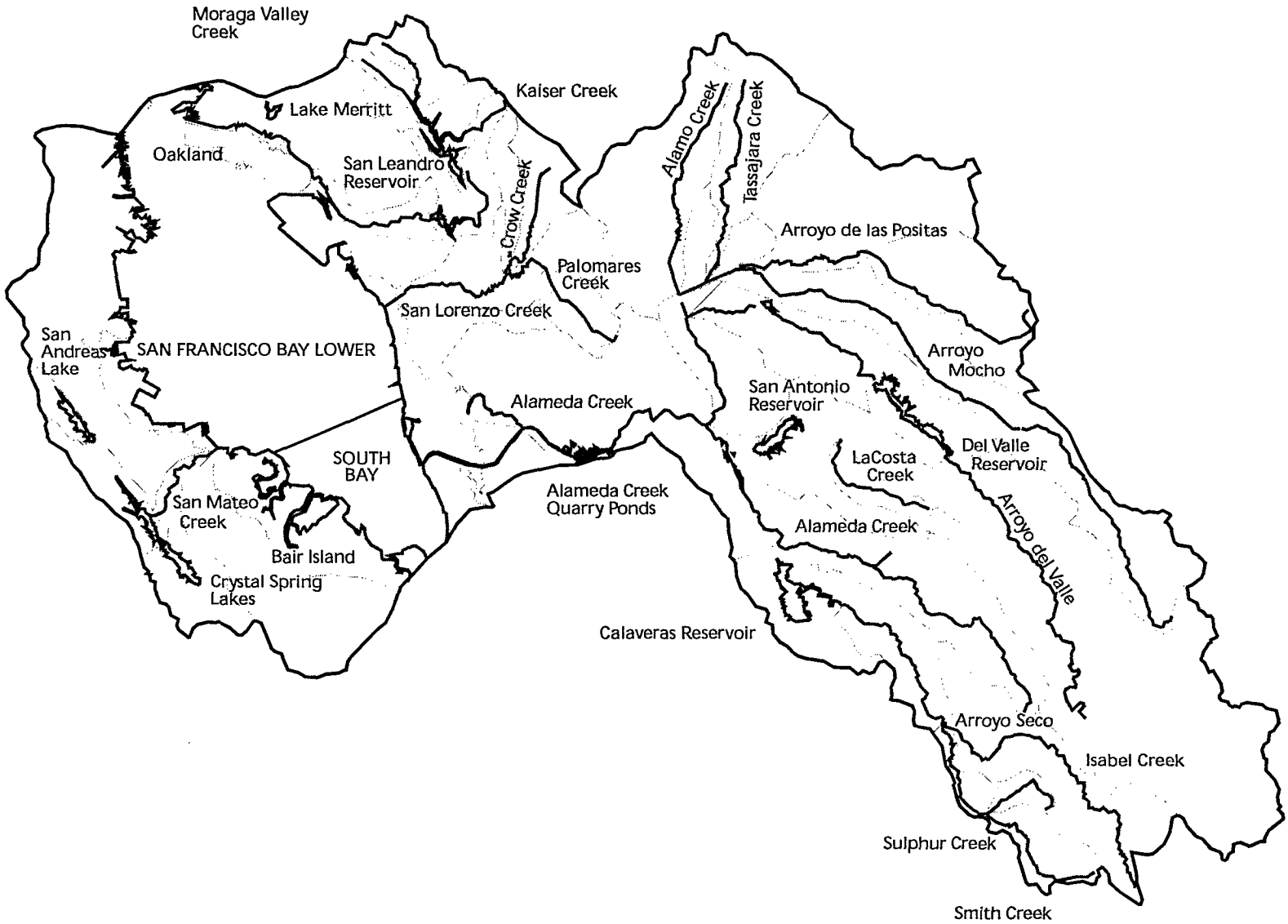
SIGNIFICANT SURFACE WATERS

SIGNIFICANT SUBWATERSHED BOUNDARY

Figure 2-5
Central Basin (3)

SCALE: 1:250,000

C—107609



BASIN BOUNDARY

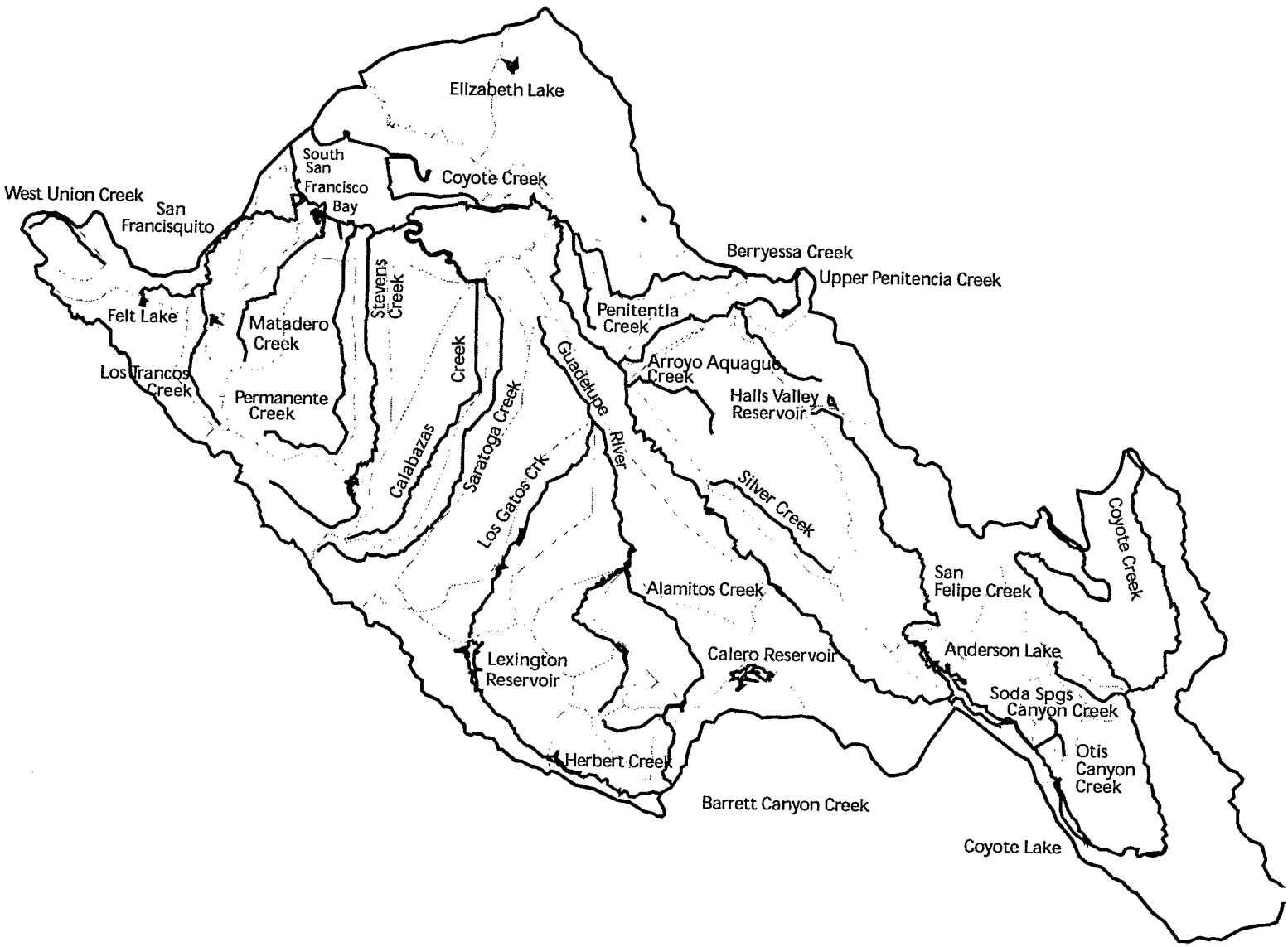
SIGNIFICANT SURFACE WATERS

SIGNIFICANT SUBWATERSHED BOUNDARY

Figure 2-6
South Bay Basin (4)

SCALE: 1:500,000

C—107610



BASIN BOUNDARY

SIGNIFICANT SURFACE WATERS

SIGNIFICANT SUBWATERSHED BOUNDARY

Figure 2-7
Santa Clara Basin (5)

SCALE: 1:450,000

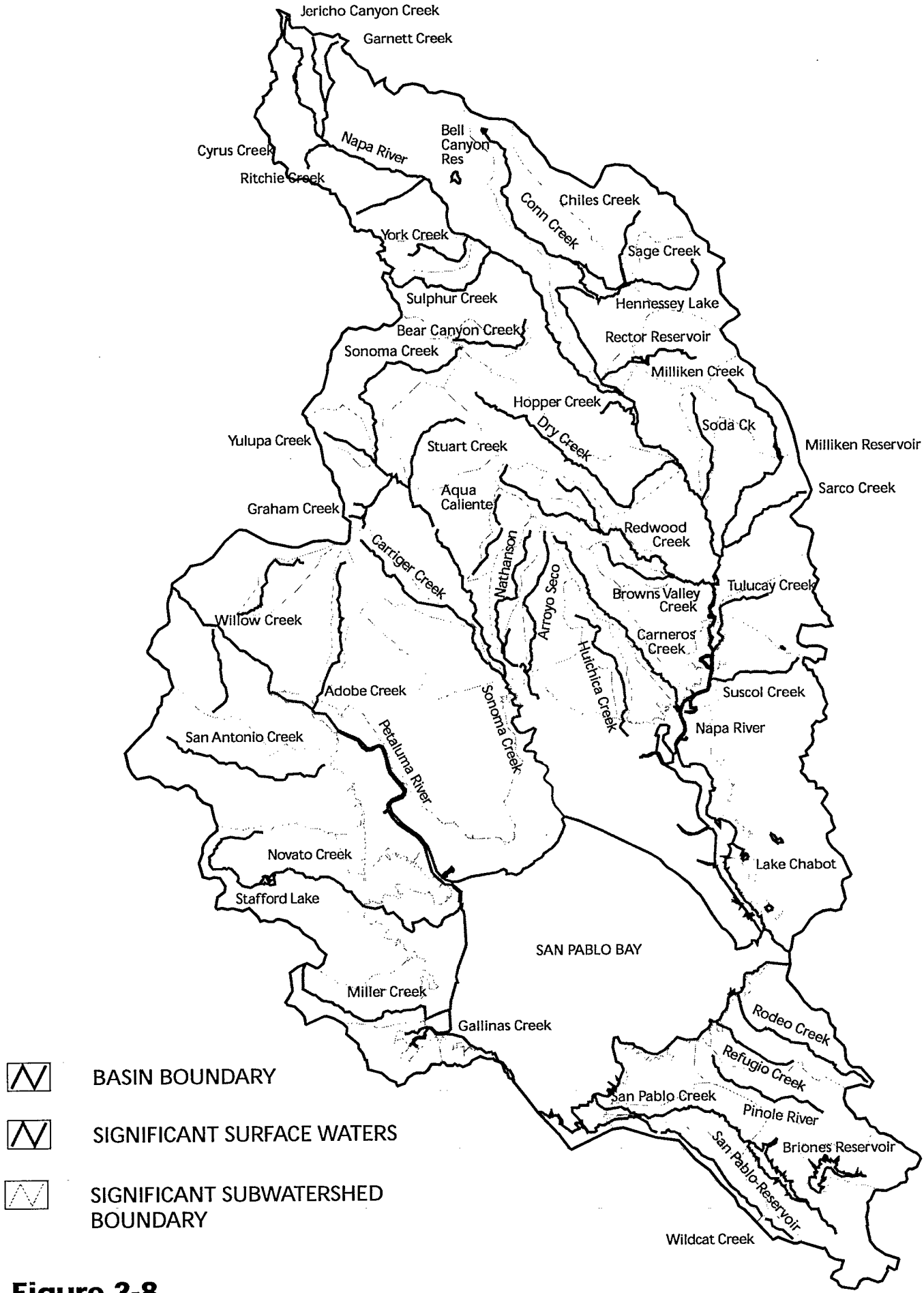


Figure 2-8
San Pablo Basin (6)

SCALE: 1:380,000

C—107612

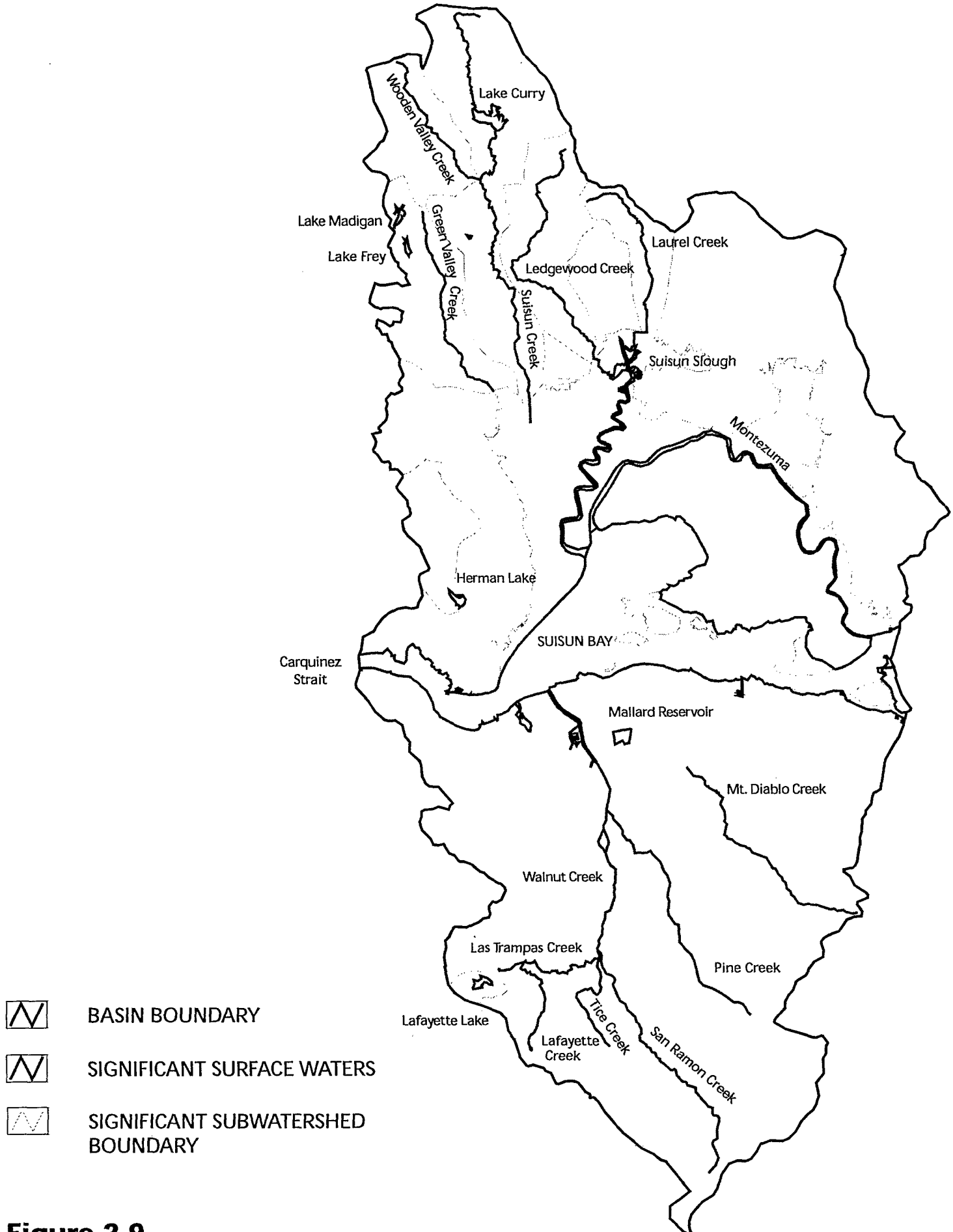


Figure 2-9
Suisun Basin (7)

SCALE: 1:320,000

C—107613

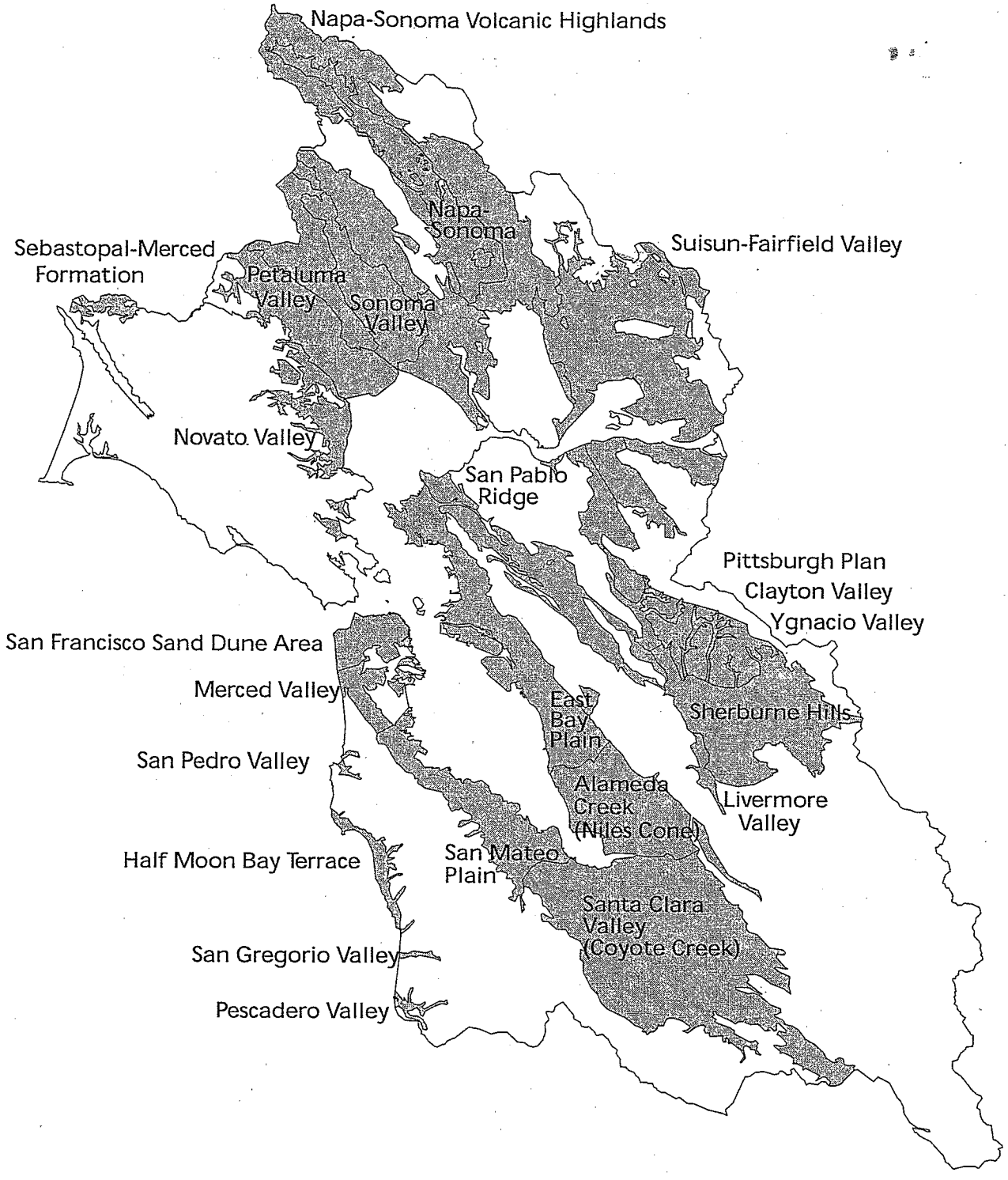
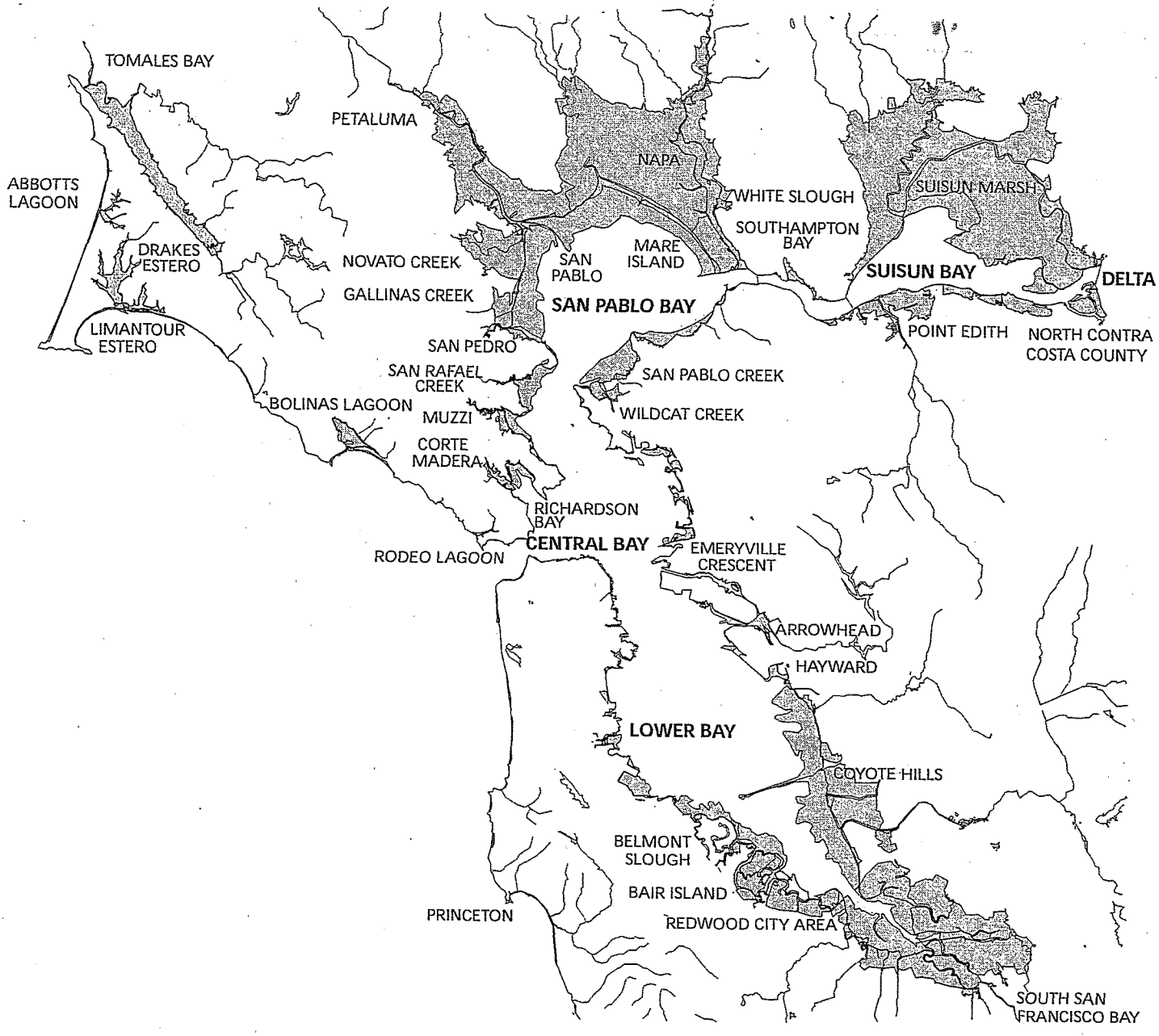


Figure 2-10
Significant Groundwater Basins

SCALE: 1:960,000

C-107614



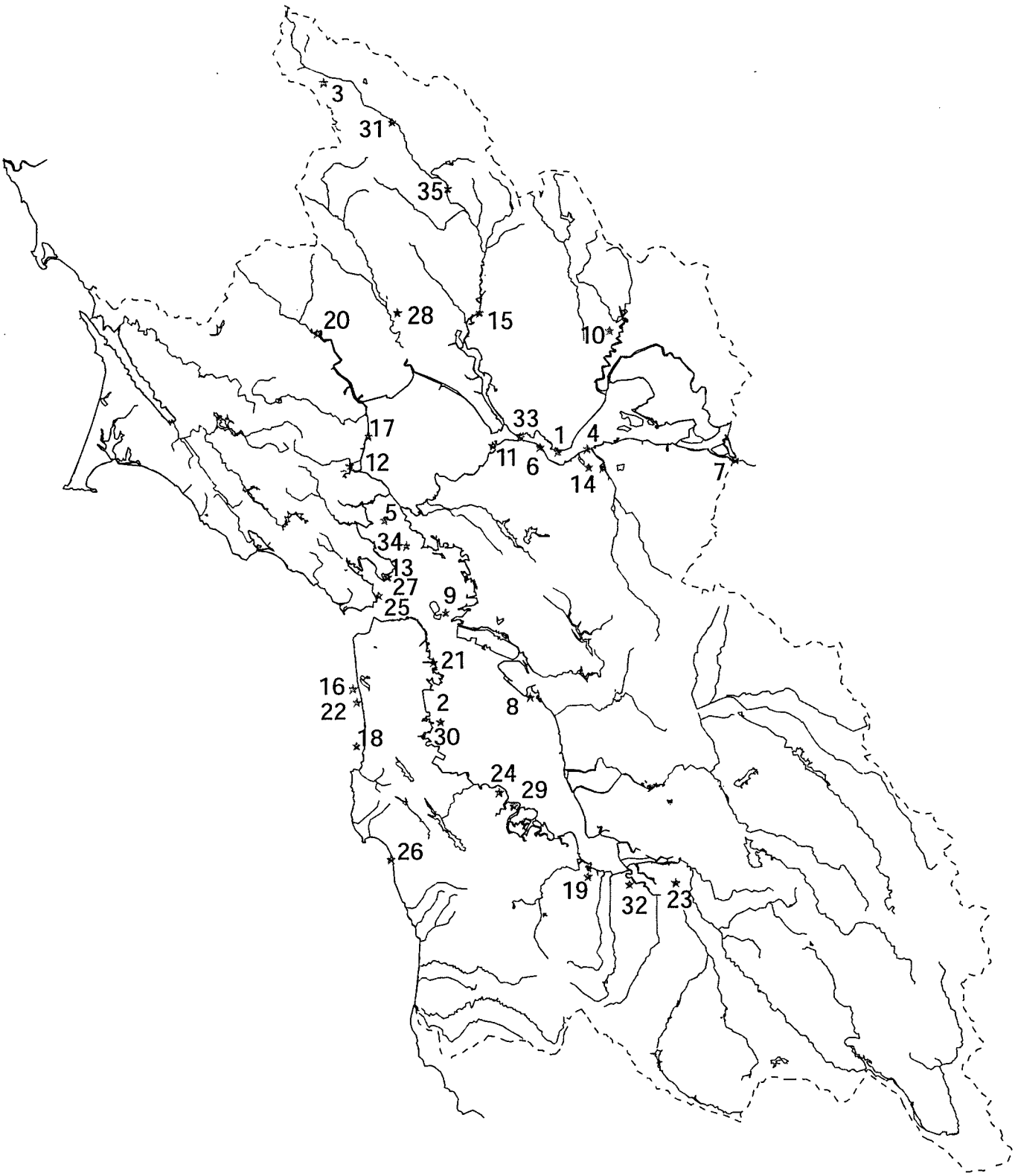
SIGNIFICANT SURFACE WATERS

GENERAL WETLAND AREAS

Figure 2-11
General Locations of Wetland Areas

SCALE: 1:640,000

C-107615



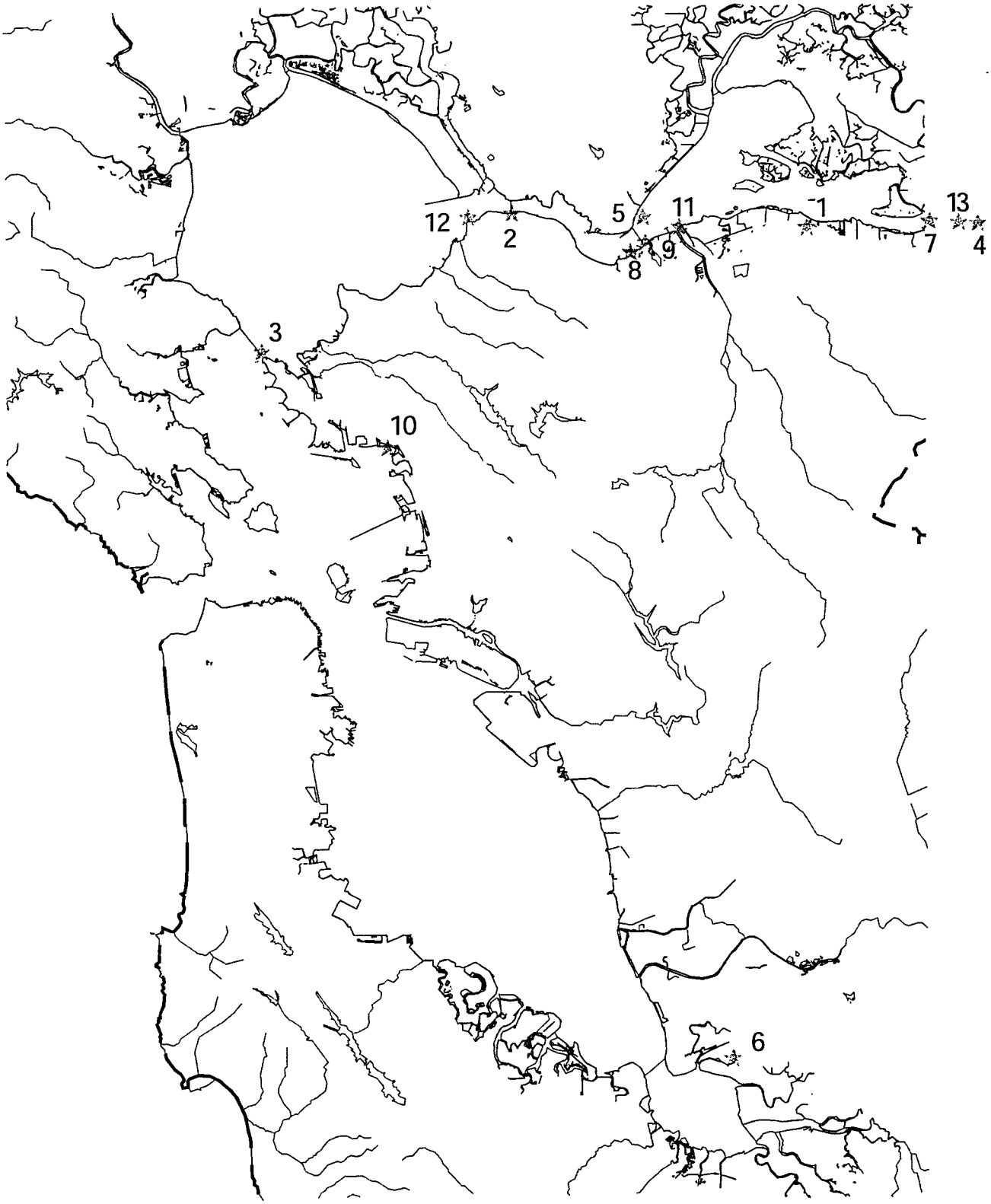
★ POTW SITES

Figure 4-1
Publicly Owned Treatment Works

SCALE 1:960,000

C—107616

C-107616



★ INDUSTRIAL DISCHARGER SITES

Figure 4-2
Industrial Dischargers

SCALE: 1:480,000

C-107617

C-107617

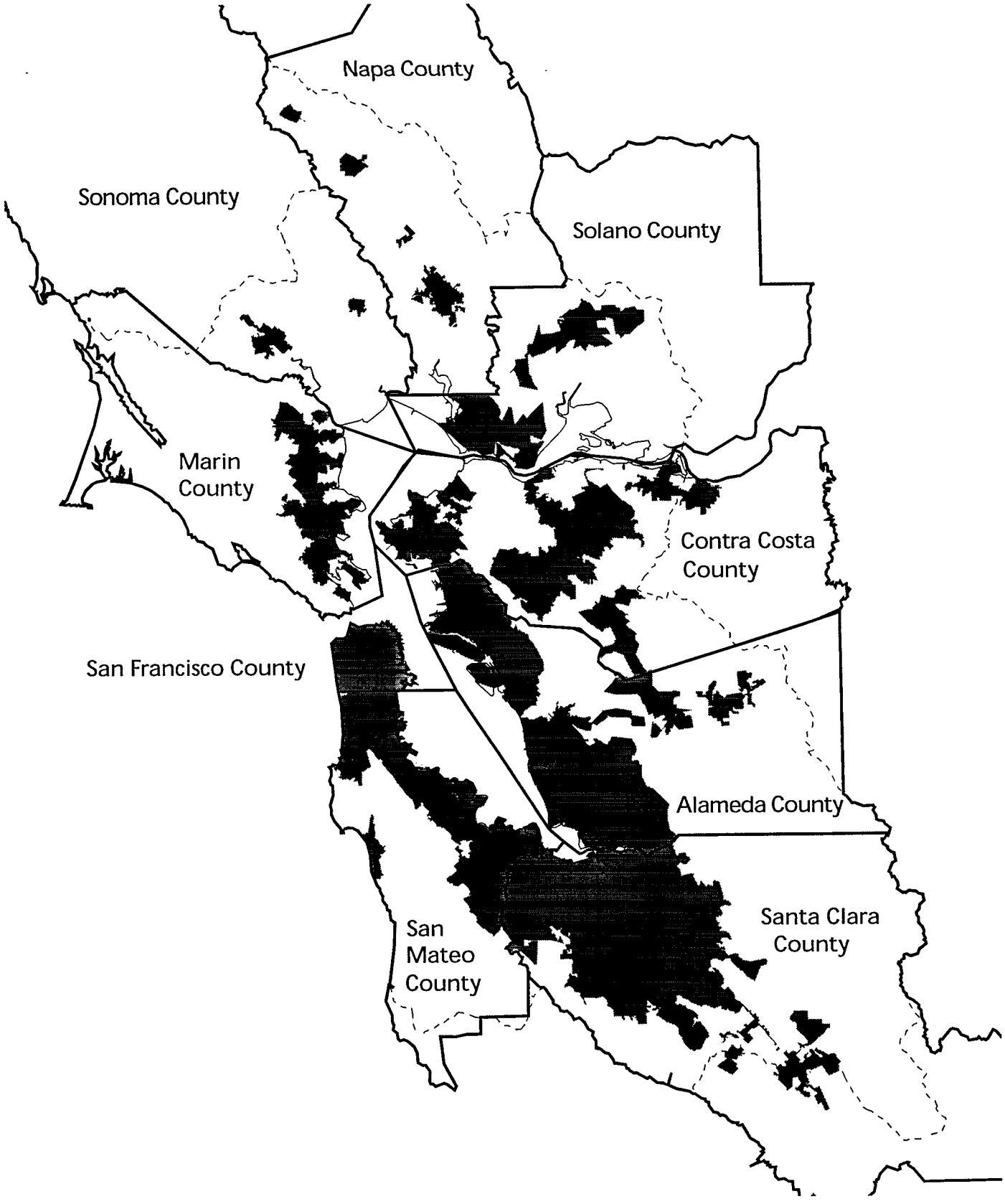
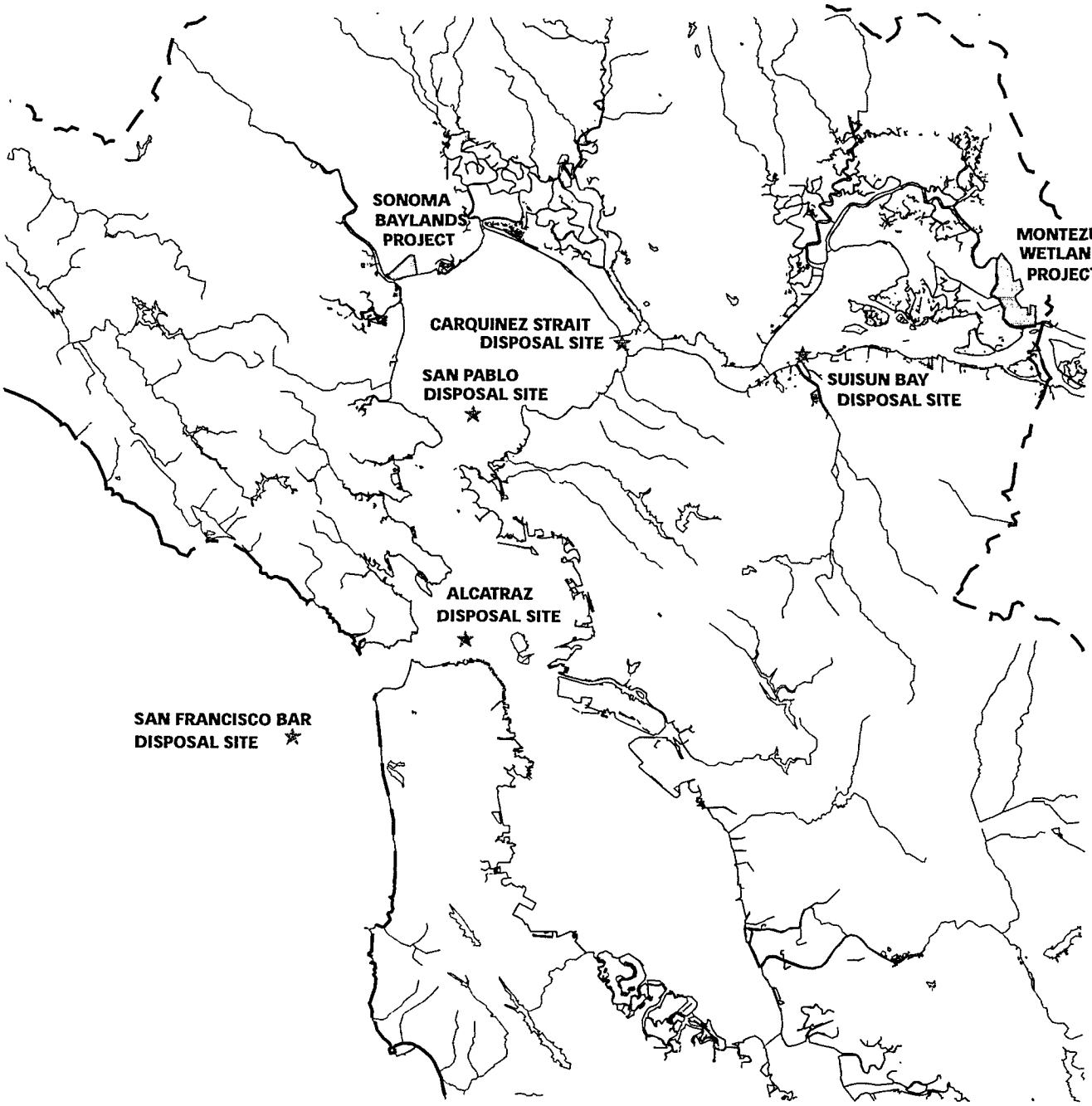


Figure 4-3
Urban Areas in
San Francisco Bay Basin

C-107618

C-107618



DREDGED MATERIAL DISPOSAL SITES

WETLAND RESTORATION SITES

Figure 4-4
Dredged Material Disposal Sites

SCALE: 1:550,000

C—107619

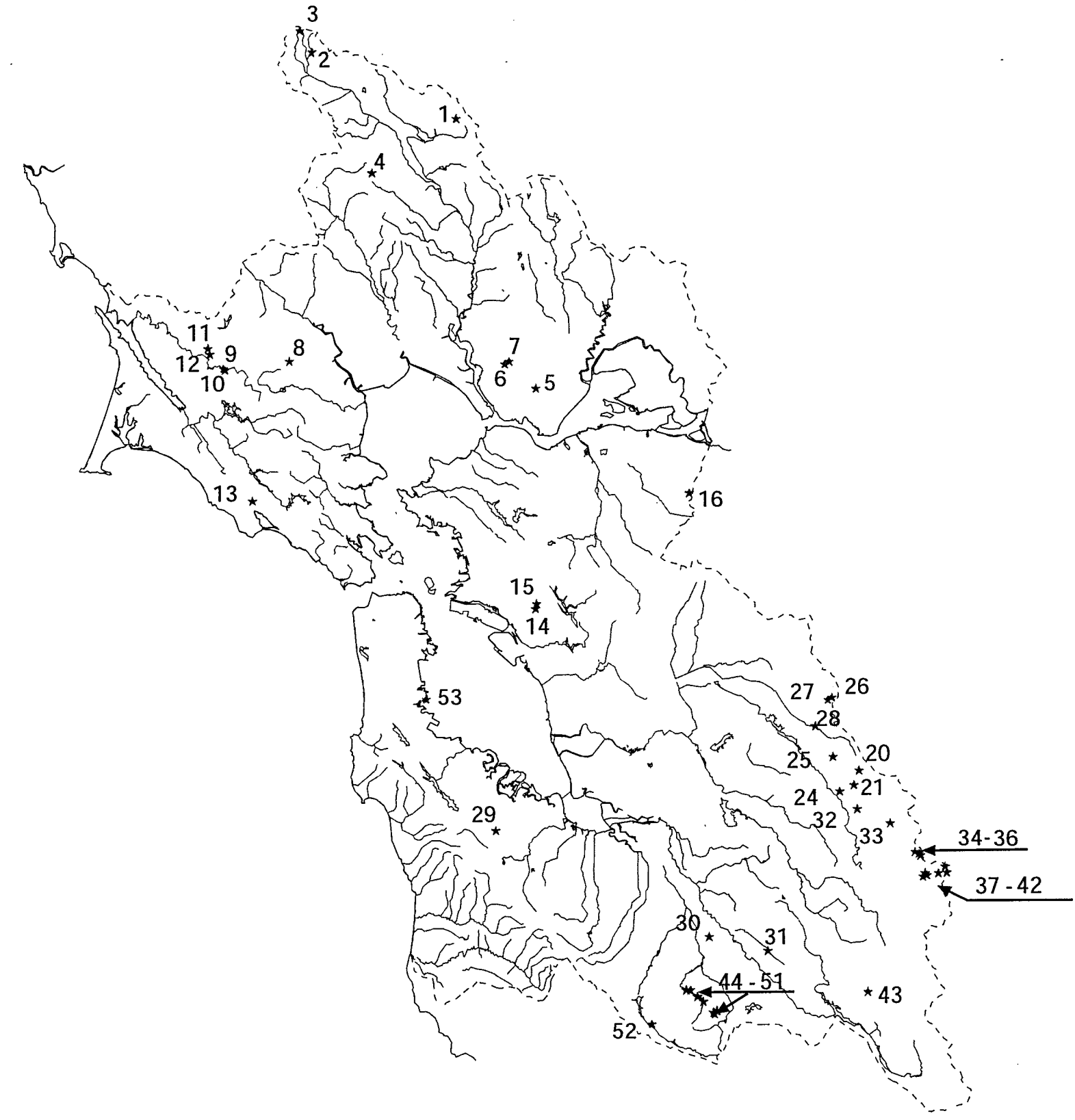
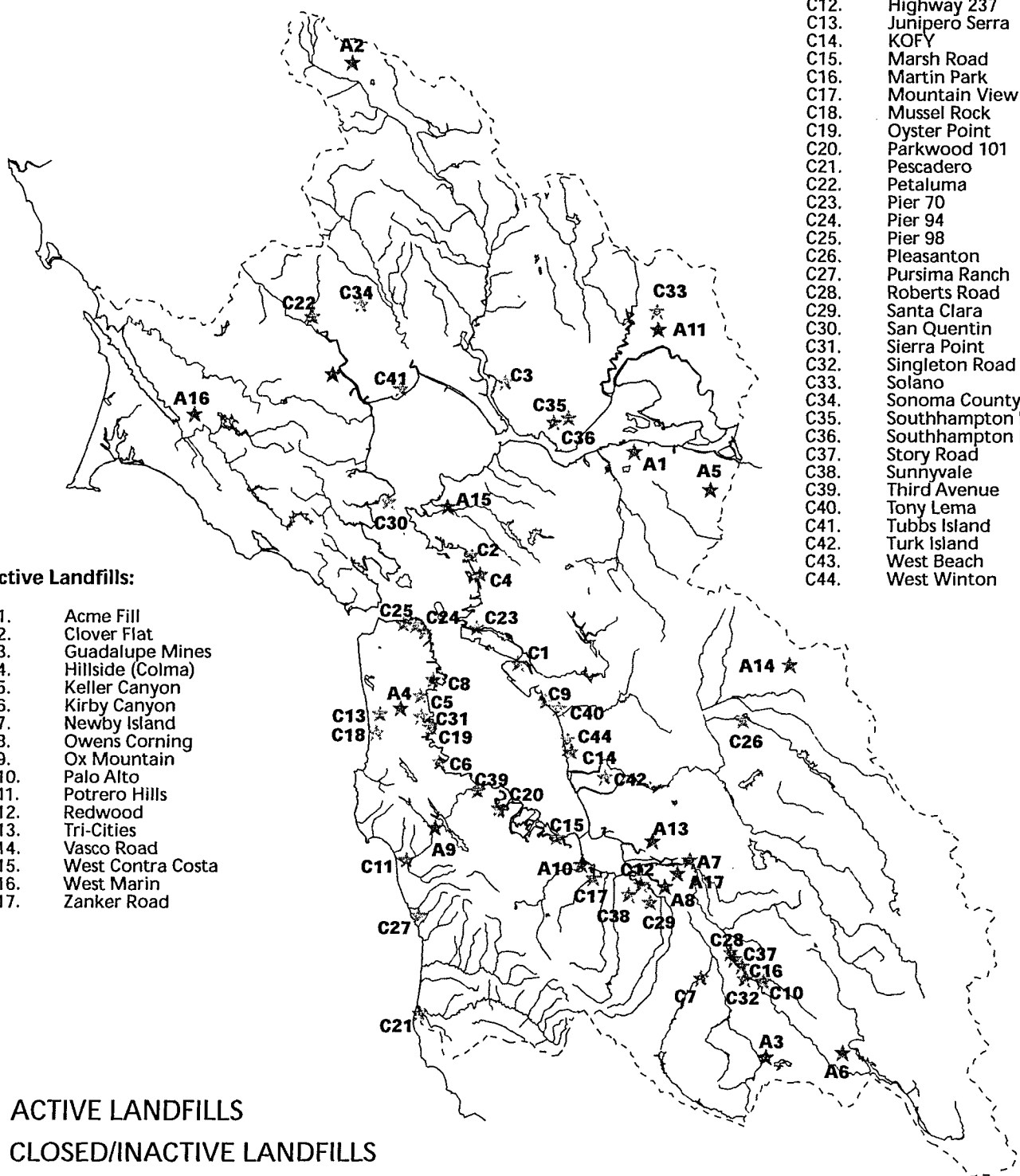


Figure 4-5
Inactive Mine Sites

SCALE 1:960,000

C-107620

C-107620



Closed/Inactive Landfills

C1. Alameda
C2. Albany
C3. American Canyon
C4. Berkeley
C5. Brisbane
C6. Burlingame
C7. Campisi Drive
C8. Candlestick Park
C9. Davis Street
C10. Eastside
C11. Half Moon Bay
C12. Highway 237
C13. Junipero Serra
C14. KOFY
C15. Marsh Road
C16. Martin Park
C17. Mountain View
C18. Mussel Rock
C19. Oyster Point
C20. Parkwood 101
C21. Pescadero
C22. Petaluma
C23. Pier 70
C24. Pier 94
C25. Pier 98
C26. Pleasanton
C27. Pursima Ranch
C28. Roberts Road
C29. Santa Clara
C30. San Quentin
C31. Sierra Point
C32. Singleton Road
C33. Solano
C34. Sonoma County
C35. Southhampton Blake Court
C36. Southhampton East Canyon
C37. Story Road
C38. Sunnyvale
C39. Third Avenue
C40. Tony Lema
C41. Tubbs Island
C42. Turk Island
C43. West Beach
C44. West Winton

Active Landfills:

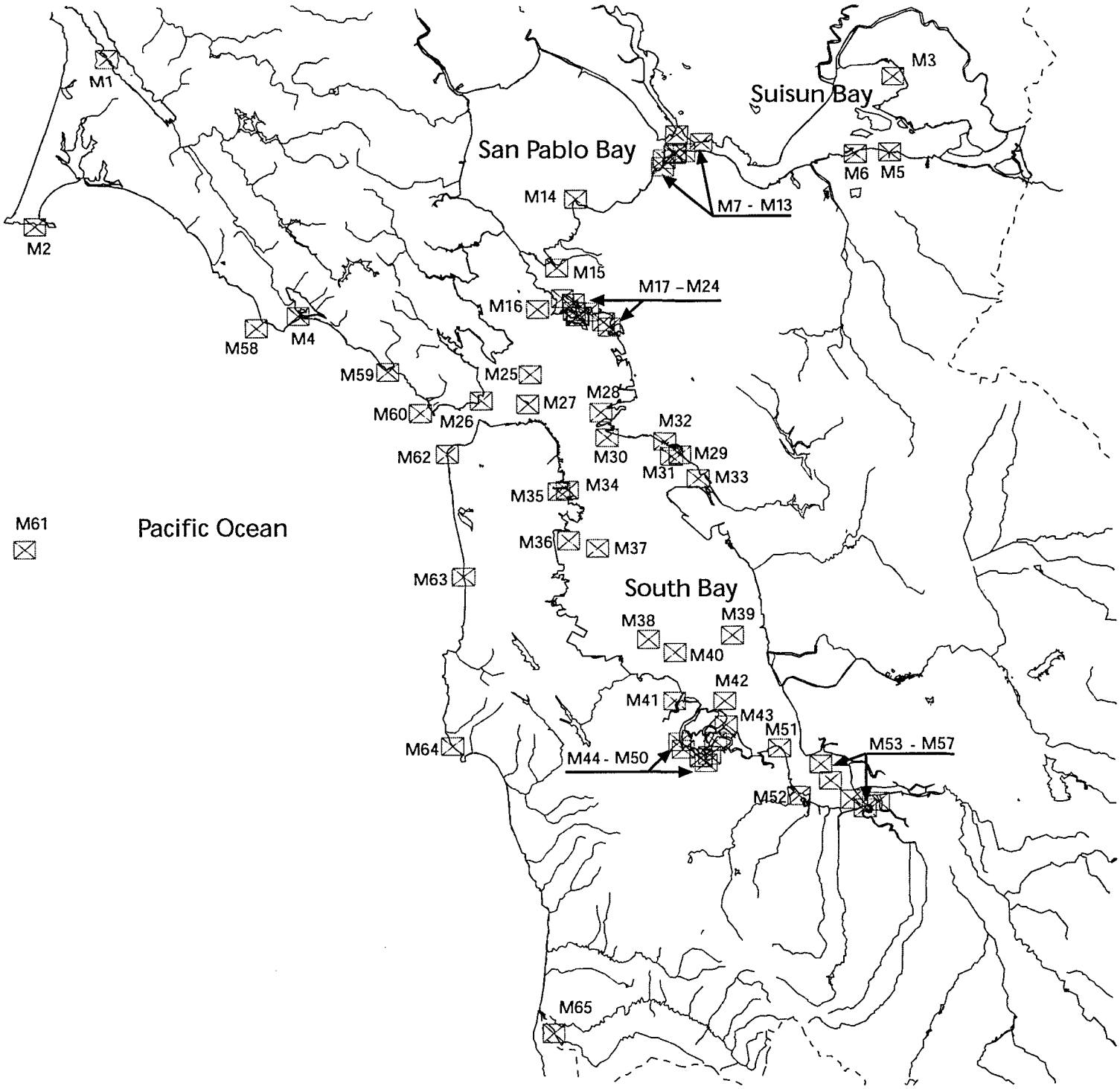
A1. Acme Fill
A2. Clover Flat
A3. Guadalupe Mines
A4. Hillside (Colma)
A5. Keller Canyon
A6. Kirby Canyon
A7. Newby Island
A8. Owens Corning
A9. Ox Mountain
A10. Palo Alto
A11. Potrero Hills
A12. Redwood
A13. Tri-Cities
A14. Vasco Road
A15. West Contra Costa
A16. West Marin
A17. Zanker Road

★ ACTIVE LANDFILLS

☆ CLOSED/INACTIVE LANDFILLS

Figure 4-6
Municipal Solid Waste Landfill Sites in the Region

SCALE 1:960,000



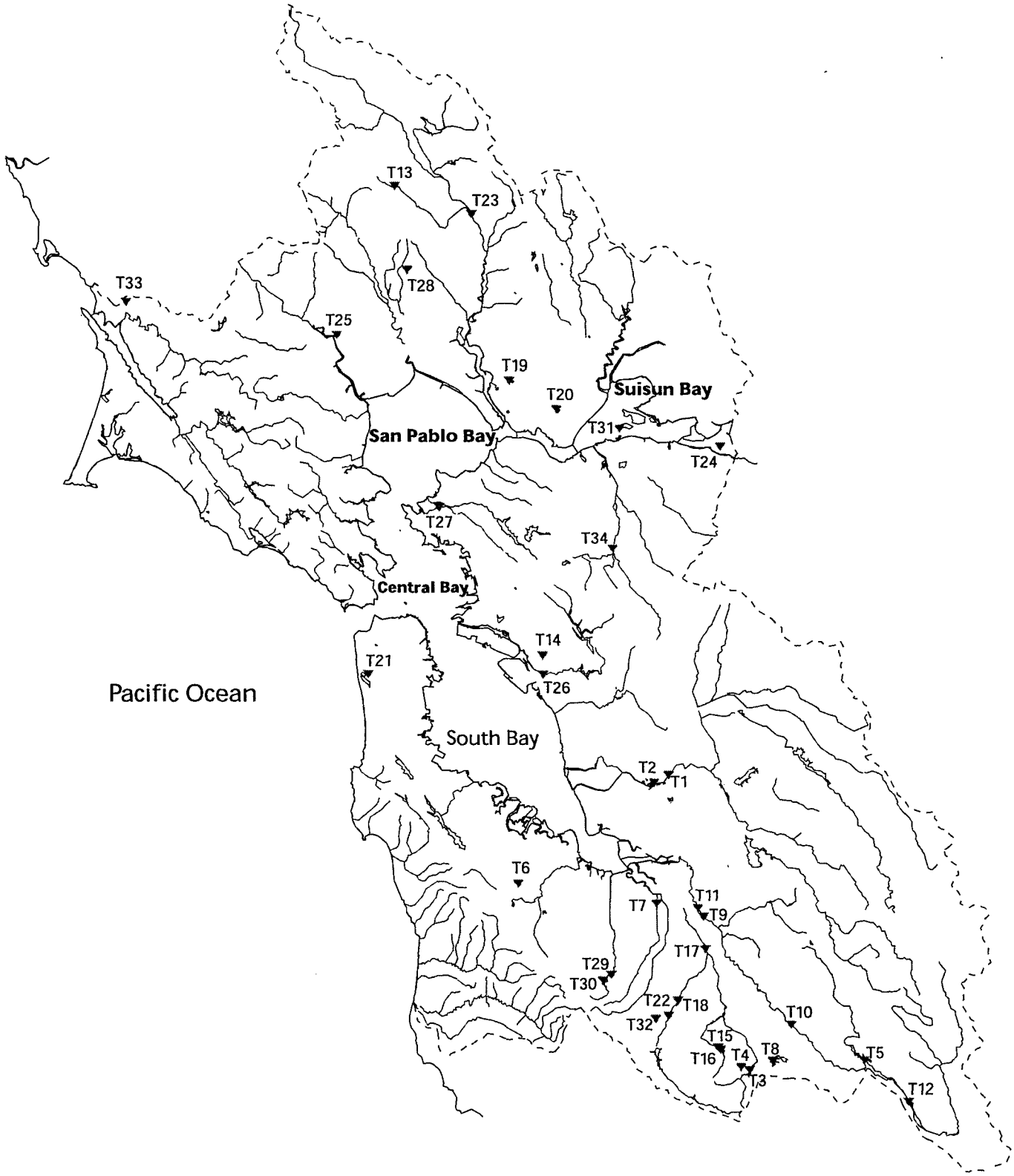
MUSSEL WATCH STATION

Figure 6-2
State Mussel Watch Program Monitoring Network

SCALE 1:500,000

C—107622

C-107622



▼ TOXIC SUBSTANCE MONITORING

Figure 6-3
Toxic Substances Monitoring Network

SCALE 1:960,000

C—107623

C-107623

TABLE 2-1 BASIN 1 - MARIN COASTAL BASIN

BASIN	WATERBODY	AGR	COLD	COMM	EST	FRSH	GWR	IND	MAR	MIGR	MUN	NAV	PROC	RARE	REC-1	REC-2	SHELL	SPWN	WARM	WILD
Pacific Ocean (Marin)				E				E	E	E		E		E	E	E	E	E		E
Abbotts Lagoon									E						E	E				E
Drakes Estero				E					E					E	E	E				E
	First Valley Creek		E												P	E	E	E		E
Limantour Estero				E					E					E	E	E	E	E		E
Coast Creek			E												E	E	E	E		E
Alamere Creek			E												P	E				E
Crystal Lake			E												P	P		E	E	E
Bolinas Bay																				
	Bolinas Lagoon			E					E	E				E	E	E	E	E		E
	Easkoot Creek																			
	McKennan Gulch Creek																			
	Morses Gulch Creek																			
	Pike County Gulch Creek																			
	McKennan Gulch Creek																			
Redwood Creek		E	E			E					E				E	E	E	E	E	E
Rodeo Lagoon																				
	Rodeo Creek		E						E					E	E	E		E		E
Tomales Bay																				
	Tomales Bay Estuary																			
	Millerton Gulch																			
	Lagunitas Creek	E	E							E	E			E	E	E		E	E	E
Walker Creek			E							E				E	P	P		E	E	E
	Laguna Lake																			
	Frink Canyon Creek																			
	Walker Creek		E							E				E	P	P		E	E	E
	Verde Canyon Creek																			
	Salmon Creek																			
	Soule Joule Reservoir					E					E				E	E			E	E
Lagunitas Creek		E	E							E	E			E	E	E		E	E	E
	Kent Lake		E								E				E	E		E	E	E
	Big Carson Creek																			
	Bear Valley Creek																			
	Devils Gulch Creek																			
	Gulch Creek																			
	Nicasio Reservoir		P			E					E				E	E		E	E	E
	Nicasio Creek		E			E				E	E				E	E		E		E
	Halleck Creek																			
	Alpine Lake		E								E				E	E		E	E	E
	Bon Tempe Lake		E								E				E	E		E	E	E
	Lake Lagunitas		E								E				E	E		E	E	E
	Olema Creek		E							E		E			E			E	E	E
	Pine Gulch Creek		E							E	E					E		E	E	E

E: Existing Beneficial Use P: Potential Beneficial Use L: Limited Beneficial Use

Water bodies listed here may not correspond exactly to those that appear on Figure 2-3.

TABLE 2-2 BASIN 2 - SAN MATEO COASTAL

BASIN	WATERBODY	AGR	COLD	COMM	EST	FRSH	GWR	IND	MAR	MIGR	MUN	NAV	PROC	RARE	REC-1	REC-2	SHELL	SPWN	WARM	WILD
Lake Merced			E								P				E	E		E	E	
San Pedro Creek			E							E	E					E		E	E	
San Vincente Creek		E	E							E	E			E	P	P		E		
Denniston Creek		E	E							E	E			E	E	E		E	E	
Frenchmans Creek		E	E							E				E	E	E		E	E	E
Pilarcitos Creek		E	E							E	E			E	P	P		E	E	E
	Apanolio Creek																			
	Arroyo Leon Creek																			
	Mills Creek																			
	Pilarcitos Lake		E								E			E	L	E		E	E	E
Purisima Creek		E	E							E				E	E	E		E		E
Lobitas Creek		E	E							E				E	E	E		E		E
Tunitas Creek		E	E							E				E	P	P		E	E	E
San Gregorio Creek		E	E							E				E	E	E		E	E	E
	Alpine Creek																			
	El Corte de Madera Creek		E							P				E	P	E		P	E	E
	La Honda Creek																			
	Woodruff Creek																			
	Clear Creek																			
	Harrington Creek																			
	Bogess Creek																			
	Mindego Creek																			
Pomponio Creek		E	E							E		P			E			E	E	E
	Pomponio Reservoir																			
Butano Creek																				
Pescadero Creek		E	E							E	E			E	E	E		E	E	E
	Fall Creek																			
	Hoffman Creek																			
	Honsinger Creek																			
	Jones Gulch Creek																			
	McCormick Creek																			
	Oil Creek																			
	Lambert Creek																			
	Peters Creek																			
	Slate Creek																			
	Tarwater Creek																			
	Little Boulder Creek																			
	Waterman Creek																			

E: Existing Beneficial Use P: Potential Beneficial Use L: Limited Beneficial Use
Water bodies listed here may not correspond exactly to those that appear on Figure 2-4.

TABLE 2-3 BASIN 3 - CENTRAL BASIN

BASIN	WATERBODY	AGR	COLD	COMM	EST	FRSH	GWR	IND	MAR	MIGR	MUN	NAV	PROC	RARE	REC-1	REC-2	SHELL	SPWN	WARM	WILD
San Francisco Bay Central .				E	E			E		E		E	E	E	E	E	E	E		E
Berkeley Aquatic Park Lagoon										E					E	E		P		E
San Rafael Creek			E									E				E			E	E
Corte Madera Creek			E							P				E	P	E		P	E	E
Ross Creek																				
Cascade Creek																				
San Anselmo Creek																				
Sleepy Hollow Creek																				
Phoenix Lake			E								E				E	E		E	E	E
Phoenix Creek																				
Bill Williams Creek																				
Richardson Bay				E	E			E		E		E		E	E	E	E	E		E
Arroyo Corte Madera del Presidio			E												P	E	E	E		E
Old Mill Creek																				
Coyote Creek			E													E			E	E
Golden Gate Channel																				
Golden Gate Park Lake(s)																E			E	E
Lake Temescal			E												E	E		E	E	E
Old Mill Creek																				

E: Existing Beneficial Use P: Potential Beneficial Use L: Limited Beneficial Use
Water bodies listed here may not correspond exactly to those that appear on Figure 2-5.

TABLE 2-4 BASIN 4 - SOUTH BAY BASIN

BASIN	WATERBODY	AGR	COLD	COMM	EST	FRSH	GWR	IND	MAR	MIGR	MUN	NAV	PROC	RARE	REC-1	REC-2	SHELL	SPWN	WARM	WILD
San Francisco Bay Lower				E	E			E		E		E		E	E	E	E			E
Foster City Lagoon															E	E		E		E
Lake Merritt																				
Bair Island																				
Lake Chabot (Alameda)		E									E				E	E		E	E	E
	Lower San Leandro Creek					E				P					P	P		P	P	E
Cull Canyon Reservoir		E													E	E		E	E	E
San Leandro Creek		E				E				P					P	P		P	P	E
	Kaiser Creek																			
	San Leandro Reservoir		E								E				L	P		E	E	E
	Moraga Valley Creek																			
San Lorenzo Creek			E			E	E			E	E				E	E		E	E	E
	Don Castro Reservoir		E												E	E		E	E	E
	Palomares Creek																			
	Crow Creek																			
San Mateo Creek			P			E								E	P	P		E		E
	Crystal Springs Lower		E								E			E		E		E	E	E
	Crystal Springs Upper		E								E			E		E		E	E	E
	San Andreas Lake		E								E			E	L	E		E	E	E
Alameda Creek		E	E				E			E					E	E		E	E	E
	Alameda Creek Quarry Ponds		E				E								E	E			E	
	Arroyo Mocho																			
	Tassajara Creek																			
	Shadow Cliffs Reservoir		E												E	E		E	E	E
	Arroyo Del Valle		E				E			P	E				P	P		E		E
	Arroyo Seco (Alameda)																			
	Arroyo de las Positas																			
	Arroyo de la Laguna		P				E			E					E	E		E	P	E
	Alamo Canal																			
	Smith Creek																			
	Del Valle Reservoir		E								E				E	E		E	E	E
	Alamo Creek																			
San Antonio Reservoir			E								E				L	E		E	E	E
	Lacosta Creek																			
Calaveras Reservoir			E								E				L	E		E	E	E
	Arroyo Hondo		E			E					E				E	E		E	E	E
	Isabel Creek																			
	Smith Creek																			
	Sulphur Creek (Alameda)																			

E: Existing Beneficial Use P: Potential Beneficial Use L: Limited Beneficial Use
Water bodies listed here may not correspond exactly to those that appear on Figure 2-6.

TABLE 2-5 BASIN 5 - SANTA CLARA BASIN

BASIN	WATERBODY	AGR	COLD	COMM	EST	FRSH	GWR	IND	MAR	MIGR	MUN	NAV	PROC	RARE	REC-1	REC-2	SHELL	SPWN	WARM	WILD
San Francisco Bay South				E	E			E		E		E		E	E	E	E	P		E
Matadero Creek			E							E					E	E		E	E	E
Permanente Creek			E												E	E		E		E
Saratoga Creek		E	E			E	E								E	E			E	E
Calabazas Creek		E	E				E					E			E	E			E	E
San Francisquito Creek			E							E					P	P		E	E	E
Los Trancos Creek																				
West Union Creek																				
Felt Lake		E													E	E		E	E	E
Stevens Creek			E			E				E					E	E		P	E	E
Stevens Creek Reservoir			E				E			E	E					E		E	E	E
Searsville Lake		E	E												E	E		E	E	E
Coyote Creek			E							E				E	P	E		E	E	E
Elizabeth Lake			E													E		E	E	E
Fremont Lagoon																				
Sandy Wool Lake				E						E					E				E	
Cotton Wood Lake			E												E	E		E	E	E
Guadalupe Reservoir			E				E				E				E	E		E	E	E
Coyote Lake		E	E								E				E	E		E	E	E
Upper Penitencia Creek																				
Cherry Flat Reservoir		E									E				L	E		E	E	E
Penitentia Creek																				
Silver Creek																				
Soda Springs Canyon Creek																				
Otis Canyon Creek																				
San Felipe Creek			P												P	P		P	E	E
Halls Valley Reservoir															E	E			E	E
Arroyo Aquague Creek																				
Berryessa Creek																				
Guadalupe River										P					P	E		P	E	E
Campbell Percolation Pond																				
Lexington Reservoir			E								E				E	E		E	E	E
Los Gatos Creek			E			E	E			P	E					P		P	E	E
Vasona Lake			E				E								E	E		E	E	E
Los Gatos Creek																				
Alamitos Creek																				
Guadalupe Creek																				
Herbert Creek																				
Calero Reservoir							E				E				E	E		E	E	E
Almaden Reservoir			E				E				E				E	E		E	E	E
Lake Elsman			E								E									E
Anderson Lake			E				E				E				L	E		E	E	E
Barrett Canyon Creek																				
Herbert Creek																				

E: Existing Beneficial Use P: Potential Beneficial Use L: Limited Beneficial Use
Water bodies listed here may not correspond exactly to those that appear on Figure 2-7.

TABLE 2-6 BASIN 6 - SAN PABLO BASIN

BASIN	WATERBODY	AGR	COLD	COMM	EST	FRSH	GWR	IND	MAR	MIGR	MUN	NAV	PROC	RARE	REC-1	REC-2	SHELL	SPWN	WARM	WILD
San Pablo Bay				E	E			E		E		E		E	E	E	E	E		E
Lake Chabot (Solano)		E	E								P				E	E		E	E	E
Coon Island																				
Dalwick Lake																				
Miller Creek			E							E				E	E	E		E	E	E
Adobe Creek																				
Wildcat Creek										E						E		E	E	E
San Pablo Creek										E						E		E	E	E
Rodeo Creek															P	E		E	E	E
Refugio Creek																				
Gallinas Creek			E											E		E			E	E
White Slough																				
Lake Anza																				
Briones Reservoir			E								E				L	P		E	E	E
San Pablo Reservoir			E								E				E	E		E	E	E
San Pablo Creek										E						E			E	E
Miller Creek			E							E				E	E	E		E	E	E
Novato Creek			P							P	E			E	P	P		P	P	E
Stafford Lake			E								E				E	E		E	E	E
Petaluma River			E						E	E		E		E	E	E		E	E	E
Willow Creek																				
San Antonio Creek			E							P					P	P		P	E	E
Adobe Creek																				

E: Existing Beneficial Use P: Potential Beneficial Use L: Limited Beneficial Use
Water bodies listed here may not correspond exactly to those that appear on Figure 2-8.

TABLE 2-6 BASIN 6 - SAN PABLO BASIN CONTINUED

BASIN	WATERBODY	AGR	COLD	COMM	EST	FRSH	GWR	IND	MAR	MIGR	MUN	NAV	PROC	RARE	REC-1	REC-2	SHELL	SPWN	WARM	WILD
	Napa Creek																			
	Ritchie Creek																			
	Sarco Creek																			
	Sulphur Creek (Napa)																			
	Suscol Creek																			
	Tulucay Creek																			
	Lake Marie	P	P												E	E		E	P	E
	Soda Creek																			
	Huichica Creek																			
	Chiles Creek		E			E					E				P	P		E	E	E
	Hennessey Lake		E								E				E	E		E	E	E
	Conn Creek		E			E				E	E				E	E		E		E
	Sage Creek		E			E					E				P	P		E	E	E
	Dry Creek	E	E							E	E				E	E		E	E	E
	Carneros Creek																			
	Rector Reservoir		E								E				L			E	E	E
	Rector Creek																			
	York Creek		E							E					P	P		E		E
	Bear Canyon Creek																			
	Browns Valley Creek																			
	Pickle Creek																			
	Redwood Creek																			
Wildcat Creek									E						E		E	E	E	
Pinole Creek		E							E					P	P		E	E	E	
San Pablo Creek									E						E		E	E	E	
Rodeo Creek														P	E		E	E	E	
	Refugio Creek																			

E: Existing Beneficial Use P: Potential Beneficial Use L: Limited Beneficial Use
Water bodies listed here may not correspond exactly to those that appear on Figure 2-8.

TABLE 2-6 BASIN 6 - SAN PABLO BASIN CONTINUED

BASIN	WATERBODY	AGR	COLD	COMM	EST	FRSH	GWR	IND	MAR	MIGR	MUN	NAV	PROC	RARE	REC-1	REC-2	SHELL	SPWN	WARM	WILD
Sonoma Creek			E							E				E	E	E		E	E	E
	Graham Creek																			
	Agua Caliente Creek																			
	Arroyo Seco Creek																			
	Stuart Creek																			
	Fowler Creek																			
	Nathanson Creek																			
	Schnell Creek																			
	Yulupa Creek																			
Napa River		E	E							E	E	E		E	E	E		E	E	E
	Dalwick Lake																			
	Bell Canyon Reservoir																			
	Kimball Reservoir										E				E	E			E	E
	Napa River	E	E							E	E	E		E	E	E		E	E	E
	Bear Canyon Creek																			
	Cyrus Creek																			
	Garnett Creek																			
	Hopper Creek																			
	Jericho Canyon Creek																			
	Milliken Reservoir		E								E				L	P		E	E	E
	Milliken Creek																			

E: Existing Beneficial Use P: Potential Beneficial Use L: Limited Beneficial Use
Water bodies listed here may not correspond exactly to those that appear on Figure 2-8.

TABLE 2-7 BASIN 7 - SUISUN BASIN

BASIN	WATERBODY	AGR	COLD	COMM	EST	FRSH	GWR	IND	MAR	MIGR	MUN	NAV	PROC	RARE	REC-1	REC-2	SHELL	SPWN	WARM	WILD
Carquinez Strait				E	E			E		E		E		E	E	E		E		E
Suisun Bay				E	E			E		E		E		E	E	E		E		E
Mallard Reservoir		E						E			E		E		L	P		E	E	E
Pacheco Pond				E						P					P				E	
Mt. Diablo Creek			E							E					E	E		E	E	E
Pacheco Creek																				
Montezuma Slough												E		E	E	E		E	E	E
Suisun Slough												E			E	E		E	E	E
Peyton Slough																				
Herman Lake			E					E			P				E	E		E	E	E
Lafayette Lake			E								E					E		E	E	E
Green Valley Creek			E			E									E	E		E	E	E
Lake Frey			E								E					P		E	E	E
Lake Madigan		E	E								E					P		E	E	E
Suisun Creek			E			E				E					P	P		E	E	E
Lake Curry											E				E	E		E	E	E
Suisun Reservoir																				
Wooden Valley Creek																				
Laurel Creek			E			E				E					E	E		E	E	E
Ledgewood Creek			E			E				E					E	E		E	E	E
Walnut Creek			E							E					P	P		E	E	E
Pine Creek			E												E	E		E	E	E
Lafayette Creek																				

E: Existing Beneficial Use P: Potential Beneficial Use L: Limited Beneficial Use
Water bodies listed here may not correspond exactly to those that appear on Figure 2-9.